PUBLIC WORKS

Sept. 1955

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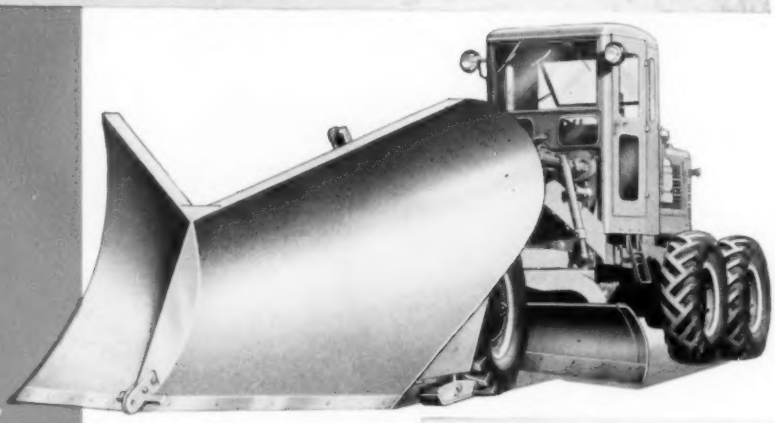
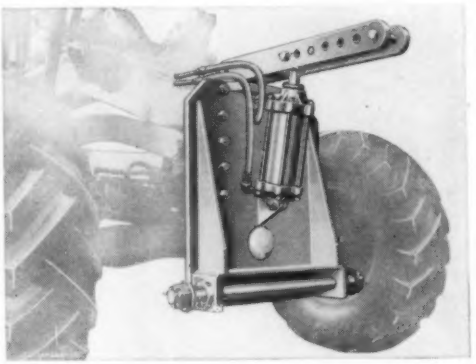
Henry D. Harral is Street Commissioner of Philadelphia and has instituted many improvements in the refuse collection program there. He is also responsible for highways, traffic and lighting. More on page 32.

HEAVY DUTY "V" TYPE SNOW PLOWS FOR GALION MOTOR GRADERS



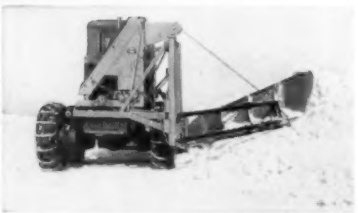
Correctly designed to keep the snow moving smoothly off the plow, and to reduce dead weight and resistance to an absolute minimum. Sturdily constructed and braced for heavy-duty service. Extra-rugged and rigid push plate. Renewable cutting edge of high carbon steel.

The GALION "V" Snow Plow is independently operated by the hydraulic system of the grader, and is controlled from the cab. It is not connected to scarifier lift. Sliding shoes (with renewable wearing plates) prevent plow from digging into the road surface.



MOUNTING BRACKET

For attaching "V" plow to grader. It is a completely assembled unit and is quickly and easily attached to any Galion grader head block. Includes a hydraulic cylinder for independent operation of the snow plow.



SNOW WINGS

Used in combination with a "V" Snow Plow, the GALION Snow Wing facilitates snow removal from road shoulders, and is a great help in cutting down high snow banks and snow drifts. When used in conjuction with regular grader blade (without "V" Plow) the Snow Wing is an effective means of removing medium depth snow and casting from 12 to 20 ft., depending on angle of blade. Wing is independently operated by separate hydraulic pump.

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The greater flexibility and wide applicability of comminution made possible by the equipment illustrated here is the result of Chicago Pump Company's original development of comminution and the Comminutor and its 20 years of experience in over 4000 installations of exclusively successful comminution.

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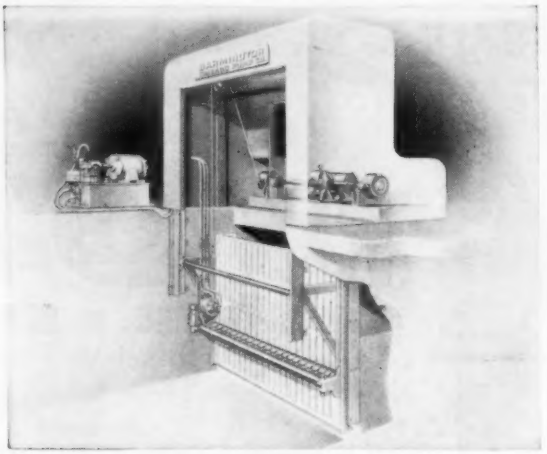
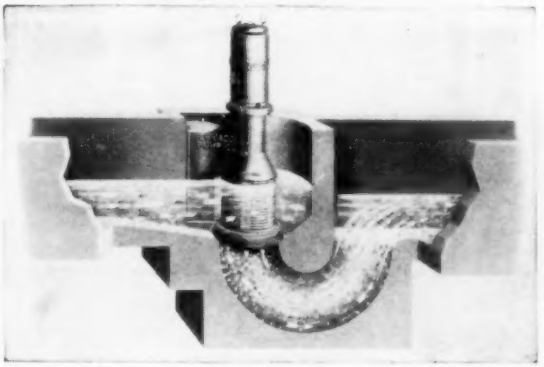
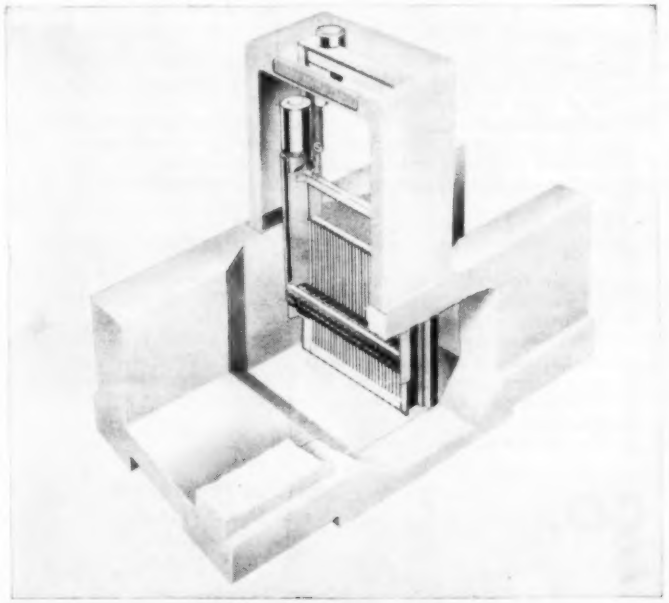


Model "A" Barminutor Screening and Comminuting Machine. Designed for use in rectangular channel sections 4 to 12 feet wide, sized for flows of 10 MGD and upwards.

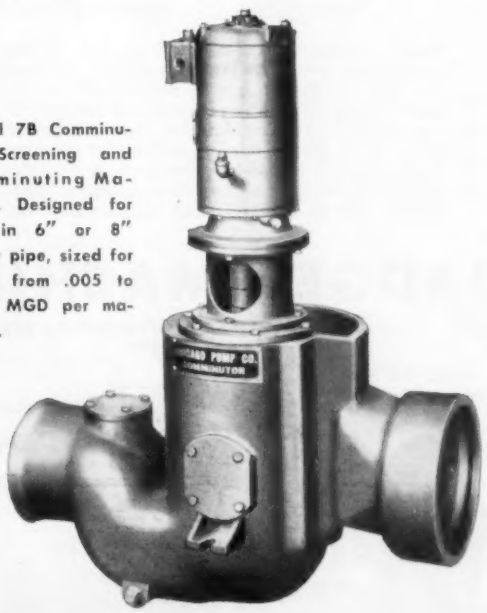


The Comminutor Screening and Comminuting Machine. Designed for use in hydraulically designed feeder basin, sized for flows from .175 to 25 MGD per machine.

◀ Model "B" Barminutor Screening and Comminuting Machine. Designed for use in rectangular channel sections 1 to 3 feet wide, sized for flows from .09 to 15 MGD.



Model 7B Comminutor Screening and Comminuting Machine. Designed for use in 6″ or 8″ sewer pipe, sized for flows from .005 to .175 MGD per machine.



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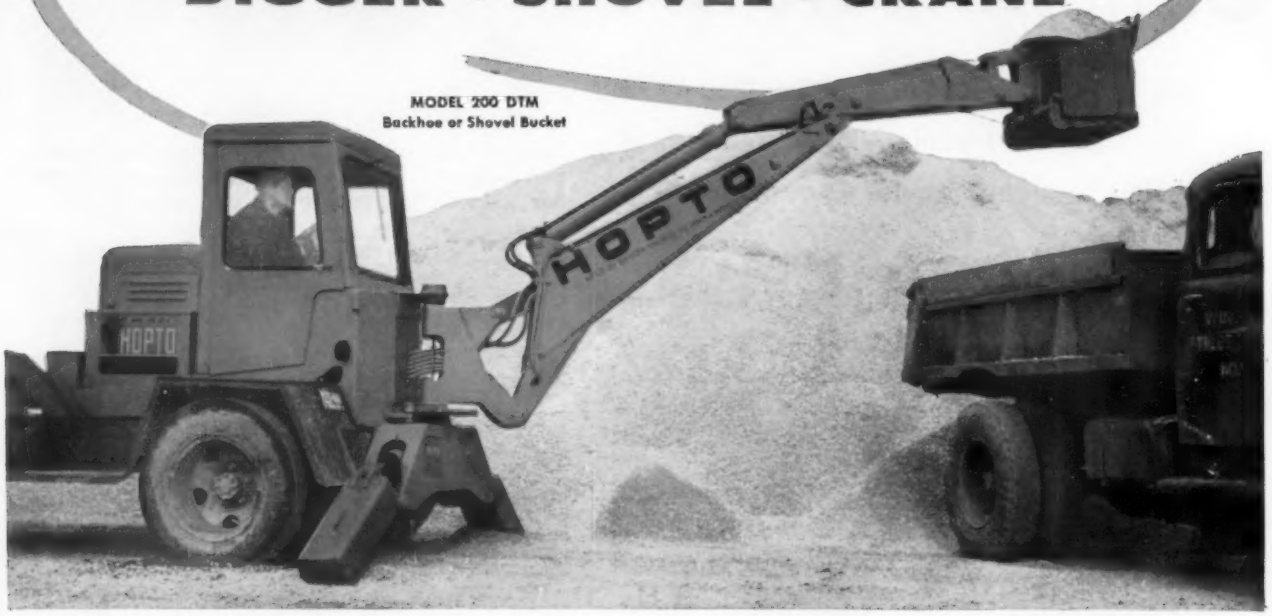

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Backhoe or Shovel Bucket

FAST CYCLING . . . HYDRAULICALLY OPERATED . . . EASILY MASTERED!

HOPTO Model 200 DTM illustrated above mounts on any 1½ ton or larger truck. This low-cost, big-capacity, versatile unit gives you a power shovel, crane and backhoe at *low equipment investment!*
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Get all the facts and you'll get HOPTO!

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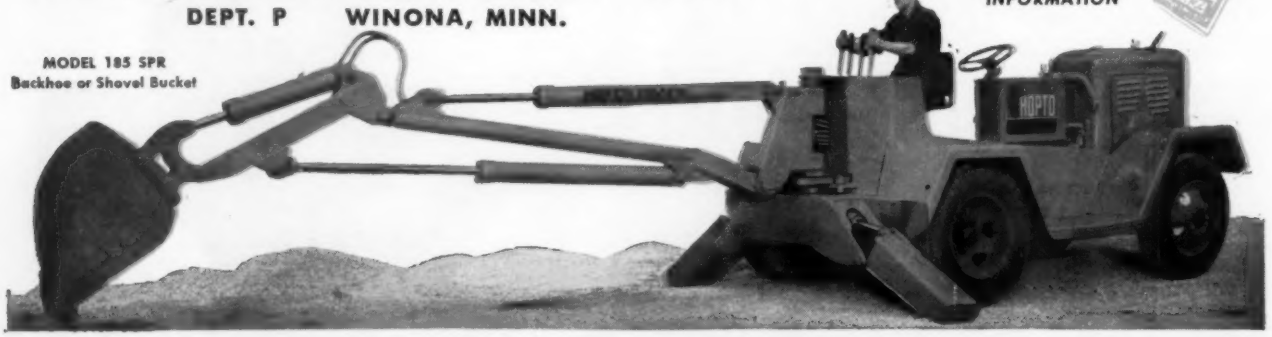

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PUBLIC WORKS MAGAZINE

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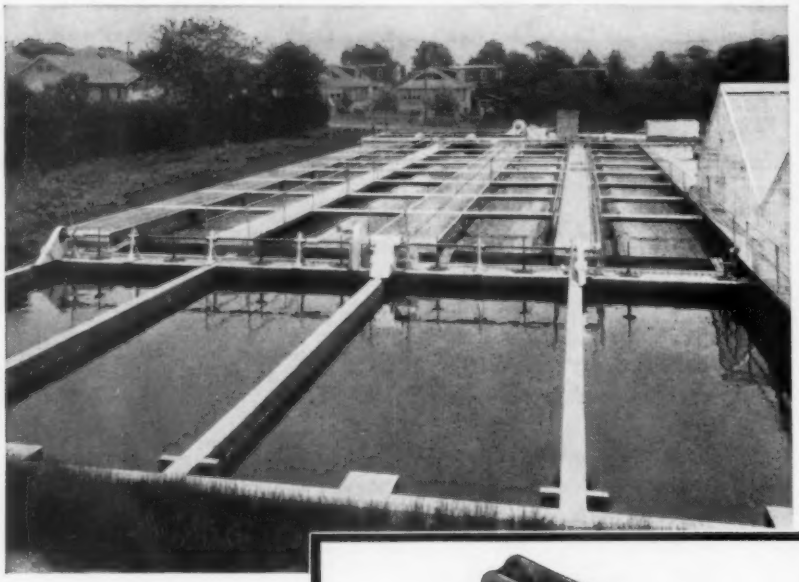
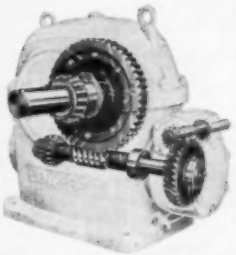
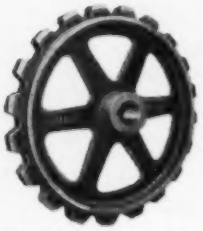


FOR 15 YEARS, the Link-Belt chain on final tank Straightline Collectors at this Collingswood (N.J.) activated sludge plant rendered dependable service, running 24 hours per day, *without replacement.* Straightline collectors in primary tanks have been in service for 24 years without replacement. Clearness of effluent may be judged by reflection of the drive machinery in final tanks in foreground.



ENCLOSED DRIVES. All types have sturdy gray iron housings, anti-friction bearings and precision gears for long trouble-free operation.

CHAIN. Made of Promal, the longer-wearing pearlitic malleable iron, has toughness, strength, high yield point, high resistance to abrasion.



SPROCKETS. Flint-Rim wheels have smooth, file hard, wear-resisting teeth, assuring maximum life.

LINK-BELT equipment is sturdily designed to last for decades

REMEMBER this when developing specifications and interpreting quotations on your water, sewage or industrial waste treatment system. It pays to give thoughtful analysis to design and equipment which will assure long life with little maintenance. Such scrutiny will also tell you why — in cities large and small . . . in plants of all types — Link-Belt installations continue to deliver top efficiency at lowest operating cost for many years.

Link-Belt offers you a broad line of *quality* sanitary equipment — including screens, collectors, mixers and complete conveying and power transmission equipment. In fact, Link-Belt pioneered such life-lengthening features as Flint-Rim sprockets and Promal chain.

With this wide choice of equipment, you also put Link-Belt's many years of technical experience to work on your needs. These two are your assurance of sturdy design . . . close attention to all construction details . . . a thoroughly tested, tried and proved system.

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LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,827

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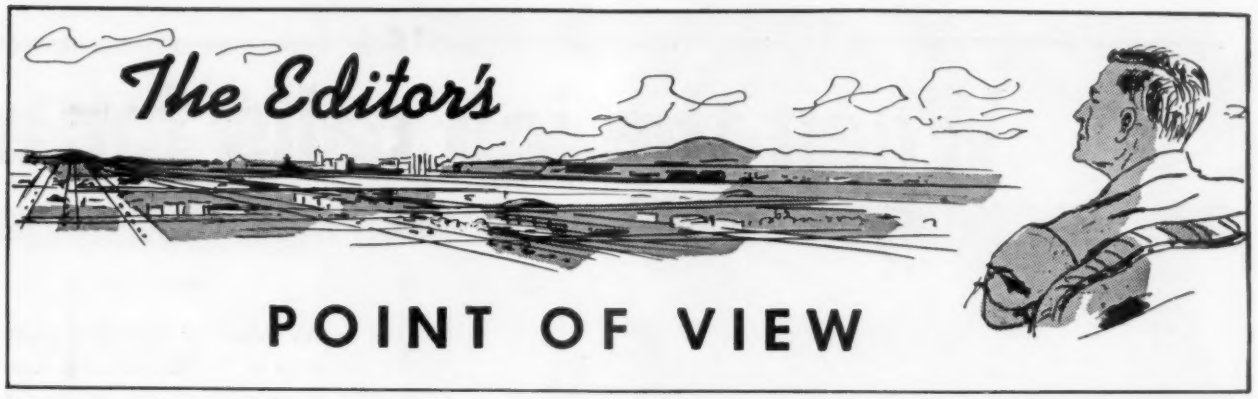

Public Works Services: An Industry of Vital Importance to the Nation

IT is fitting at this time to emphasize again the importance of the public works industry to the welfare of the nation, and to stress that it is truly an industry—as much so, for instance, as agriculture, or printing. Whether the farmer raises wheat or corn or soy beans, he employs the same background of knowledge and the same general tools of the trade. Printing utilizes essentially the same skills, procedures and equipment whether it produces a daily paper or a magazine such as this. It is precisely so with public works. In the background is the engineering and construction training plus the experience in planning and directing work; and in the performance of its functions, many kinds of equipment and materials are used, yet nearly all of the same general family.

So it is time to realize that public works is not a conglomeration of unrelated activities, each with some small responsibility to the general welfare of the community, but a profession and an industry—a public service, even—which is devoted to and serving the needs of our citizens through the cities, counties and states in which they reside. Public works is one of our most important industries, too, for if it fails national growth and development stop. The daily activities of too many of our citizens are inextricably bound in with the work it does. It needs the support and understanding of all if it is to keep up with the manifold and growing needs of the nation which it serves.

Increasing Water Usage Requires More Adequate Water Supplies

WATER consumption has been growing rather steadily over recent years, and we believe it will continue to increase. The move to the suburbs has been a factor in this increasing water consumption; and probably one of the primary reasons has been the increased leisure time of workers and the growing number of lawns, gardens and flower plots—all of them heavy water users.

We might as well stop wishing for any ability to turn the clock of time backward. Three important things to do are to improve our water distribution systems; bring our basic sources of supply up to meet modern needs; and meter all of our outlets. People are willing to pay for water; they should be provided with all they need and they should be made to pay in accordance with their use.

Look Carefully Before You Dig Under That Street Surface

PROBABLY a greater volume and variety of traffic is carried under our streets than on the surface; there are water pipes and sewers, electric and telephone cables and gas mains, to mention only a few. This means that digging through a pavement without knowing just where not to dig can cause thousands of dollars of damage. Maps of subsurface structures are usually approximate only, to use a mild term. Modern science, however, has a way to help and it ought to be used before digging starts. There are many kinds of specialized pipe line and other locators which can help take the guesswork out of digging. With the help of one of these, the area can be checked and underground structures located before digging starts. It can cost a lot of money to dig blind.

Public Relations in Reverse and Obverse

IN too many communities the water user is still referred to as the taxpayer; and the water bill is too often called the water tax or the water rent. Naturally, everyone wants to keep taxes down, and rents too. So when water works folks use this kind of language they are asking for what they usually get—not much of anything in the line of money for expansion, needed improvements or salary increases.

Water is essential, even more so than electricity or gas, and a commodity of value to boot. A realization of this fact is a first step toward good public relations and a relationship with water users that will react to the benefit of all. For a sensible approach to this subject, we suggest our readers study Joe Rosapepe's paper at the recent AWWA convention. And other than water works men might read it too, for engineers, as a class, are not always proficient in this matter of public relations.

When the job calls for a

Cast iron pipe water line installed in front of Marshall Field's in Chicago during subway construction.

Installing mechanical joint cast iron pipe to carry mine water for an Alabama Coal Company.

Rugged *is* the word for cast iron pipe. When you stop to think that cast iron water and gas mains—cast without benefit of modern metallurgical science and production skills—are in their *second century* of service in over sixty American cities, you agree that rugged *is* the word for cast iron pipe. Then, take note of the fact that *modernized* cast iron pipe, centrifugally cast, is even tougher, stronger and more uniform in quality, than the product of a century ago. For further information, write Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3.

CAST Q IRON

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

24-inch mechanical joint cast iron pipe for gas supply line at Skokie, Ill.

CAST IRON PIPE

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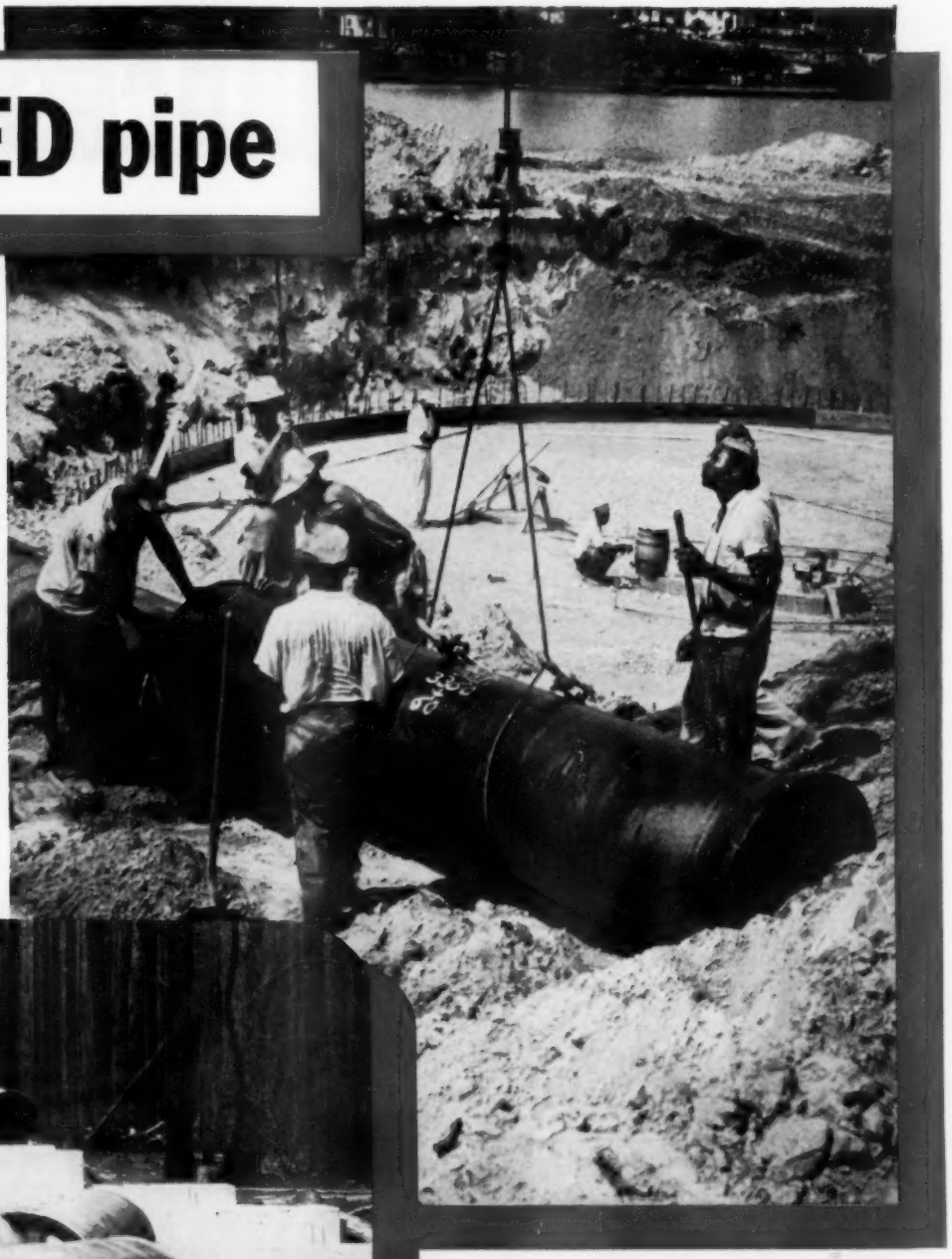
RUGGED pipe



Laying 30-inch cast iron pipe for sewage treatment plant at Panama City, Florida.

Cast iron pipe line on piers to maintain grade from sewage treatment plant to outfall—at Durham, N. C.

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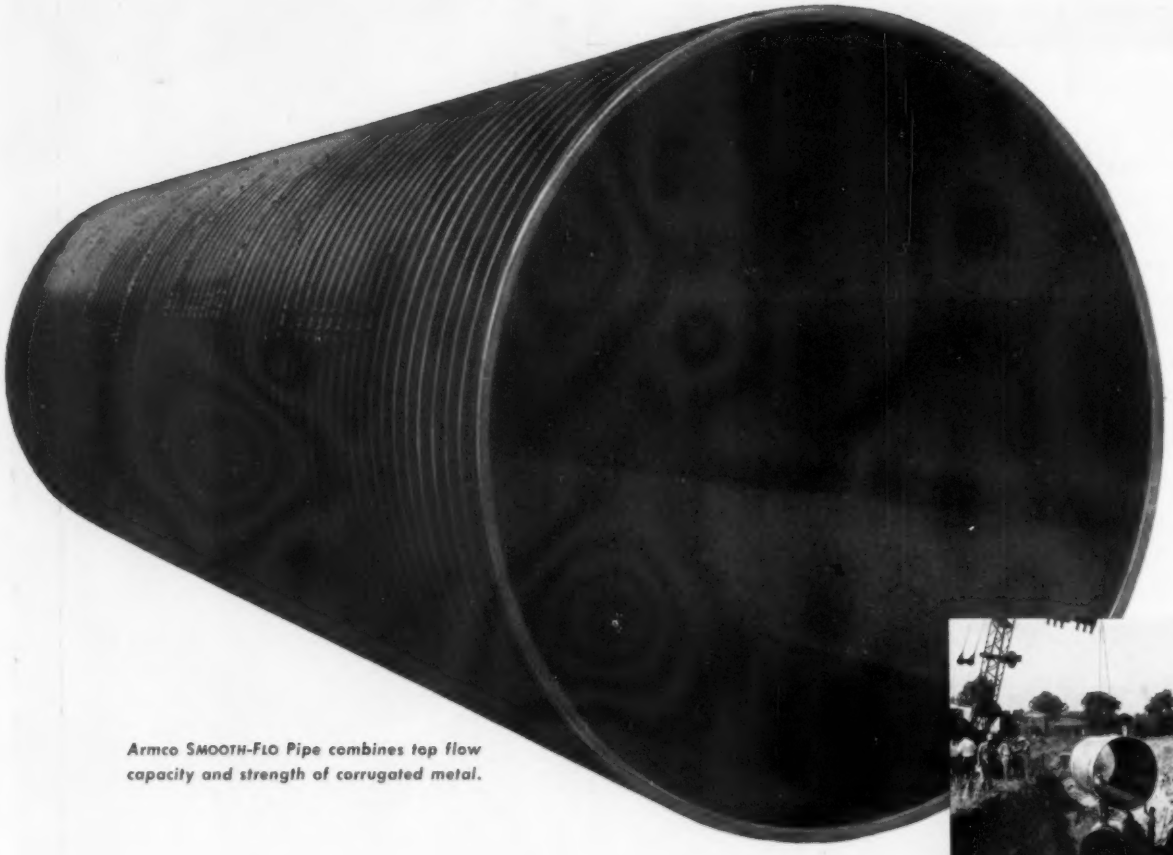
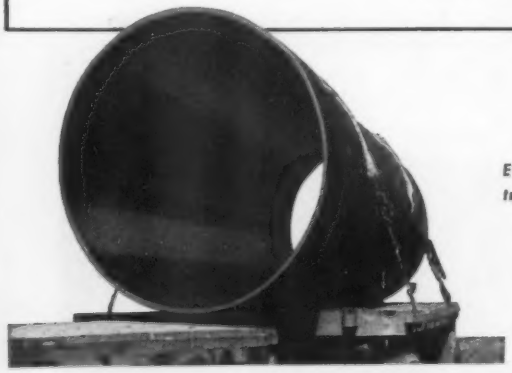


Armco SMOOTH-FLO Pipe combines top flow capacity and strength of corrugated metal.

Full scale cross section of pipe wall. Note how the full lining provides a smooth, efficient interior.



Ease of hauling and handling contribute to fast, low-cost installation.

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SMOOTH-FLO Sewer Pipe

combining **TOP FLOW CAPACITY** and **STRENGTH** of corrugated metal

Here is a new kind of sewer pipe. One that will meet your needs from every angle—capacity, strength, durability. Armco SMOOTH-FLO Sewer Pipe is efficient to start with and assures continued efficiency throughout the years. It is the result of more than 50 years' experience in pioneering and developing drainage and construction products. For the first time in a single structure, you can get all the desirable qualities necessary to efficiently handle sewage.

TOP FLOW CAPACITY

A smooth asphalt lining, centrifugally applied at more than 800 rpm, assures a flow capacity that is equal to or better than any other sewer pipe. This full lining completely fills the valleys of the corrugations. The special grade asphalt, developed by Armco, has been proved in sewer service for 30 years.

It withstands heat and cold without melting, cracking or spalling and meets the most rugged tests for adhesion and toughness. Top flow capacity is retained for the life of your sewer.

STRONG AND DURABLE

To retain continued high flow capacity, any sewer must remain structurally sound—free from failures or malalignment that would impede smooth flow. Armco SMOOTH-FLO Sewer Pipe provides complete assurance on every count.

Flexible strength

With flexible corrugated metal design, there is no danger of cracking, breaking or crushing under the impact and vibration of heavy live loads.

Strong, tight joints

Strong joints plus long lengths with high beam strength mean good alignment year after year. This is further assurance of continued high flow capacity. And since joints can't open or separate, there is no silting or entrance of ground water to overload sewers or treatment plants.

Durability for every service condition

An overall coating and lining provides ample protection for normal service. Where severe service conditions are encountered in sanitary or industrial sewers, you can get the complete protection of Armco ASBESTOS-BONDED.

Installed economy

Long lengths, light weight and joints connected by simple, bolted coupling bands all contribute to ease and speed of handling and installation. Contractors can bid low with ample profit.

ASK FOR DATA

These are just the quick highlights on this entirely new Armco SMOOTH-FLO Sewer Pipe. For the complete story applied to your specific problems, just use the coupon or telephone to call the nearest Armco engineer representative. Armco Drainage & Metal Products, Inc., 6085 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

Armco Smooth-Flo Sewer Pipe

TELL ME MORE

Please have your Armco engineer representative make an appointment to give me more data about SMOOTH-FLO Sewer Pipe.

NAME _____ TITLE _____

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STREET _____

CITY _____ ZONE _____ STATE _____

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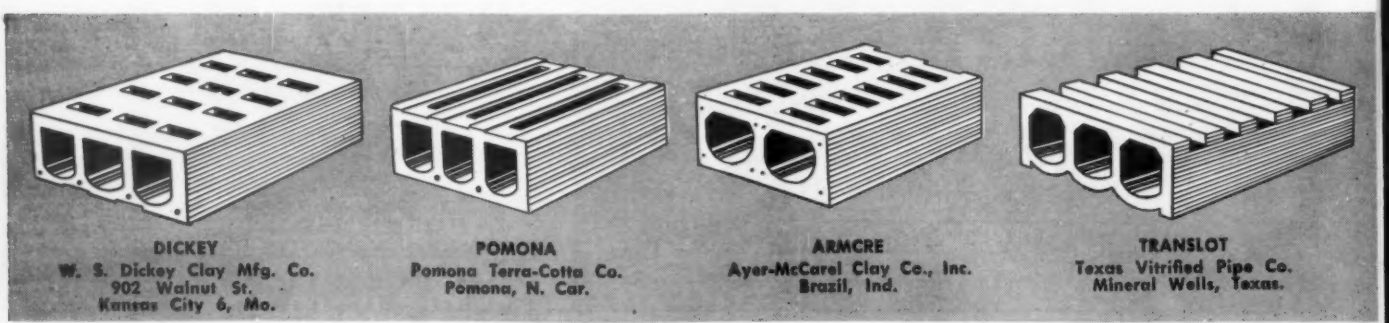

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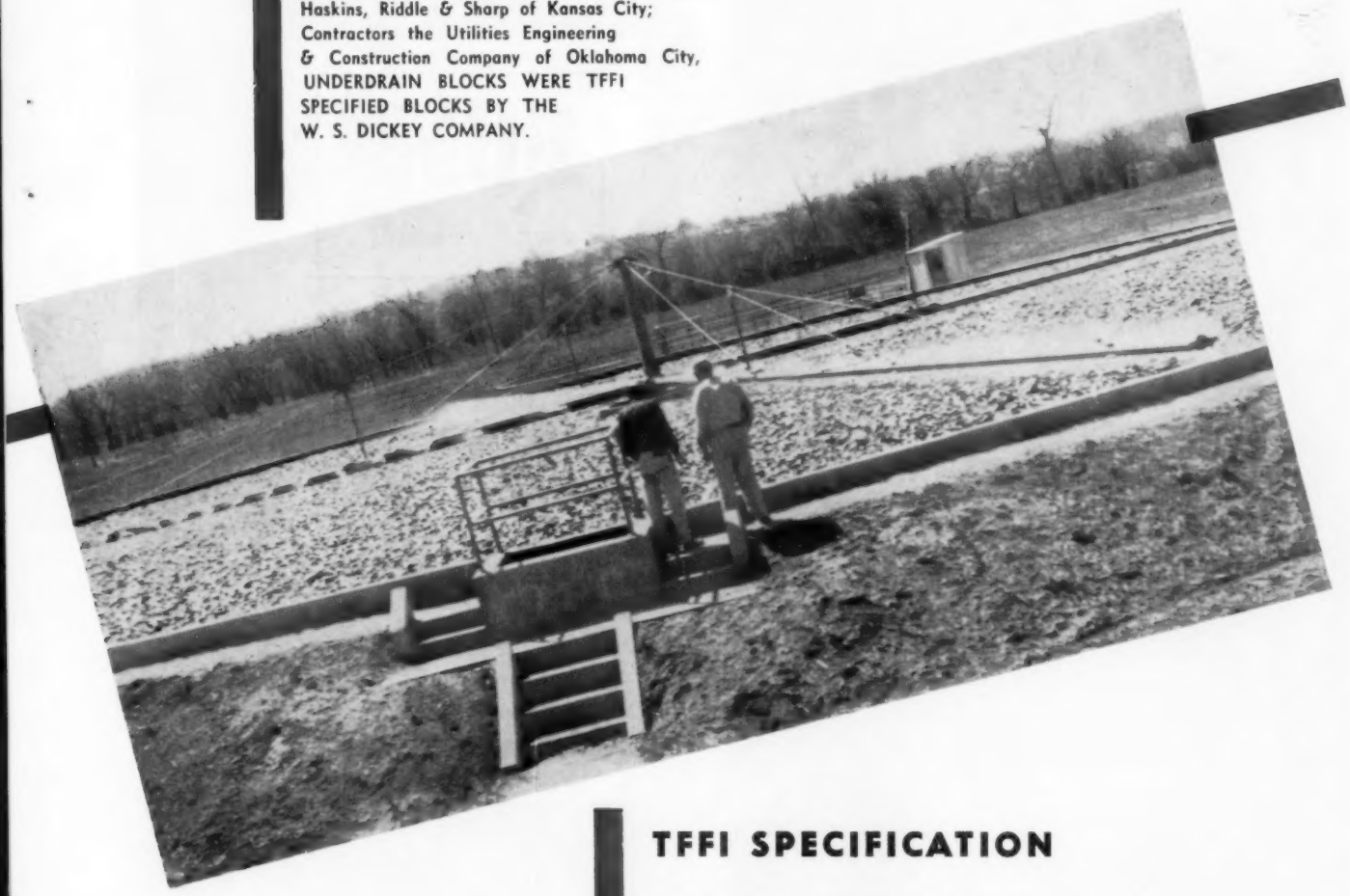
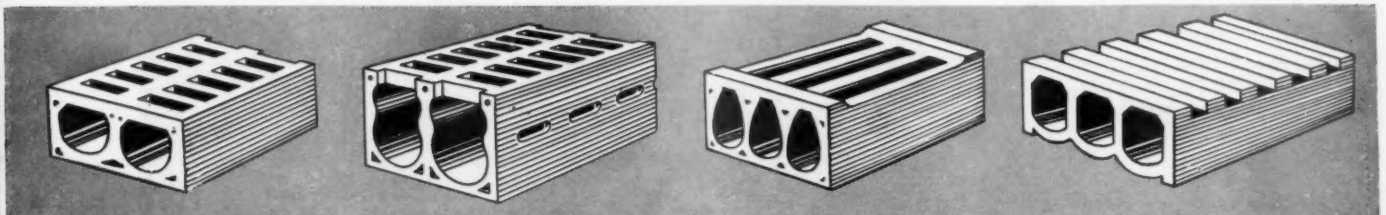
There'll be no overload problem at Independence Missouri where this 125 ft. Trickling Filter has been installed. Engineers on the job were Haskins, Riddle & Sharp of Kansas City; Contractors the Utilities Engineering & Construction Company of Oklahoma City, UNDERDRAIN BLOCKS WERE TFFI SPECIFIED BLOCKS BY THE W. S. DICKEY COMPANY.



TFFI SPECIFICATION

TFFI SPECIFICATIONS for underdrains are contained in pages 37 and 38 or the new TRICKLING FILTER HANDBOOK, third edition, under "Standard Specifications for Vitrified Clay Filter Blocks for Trickling Filters."
Available from any TFFI member.

FLOOR INSTITUTE



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Bowerston Shale Co.
Bowerston, Ohio

ACCELO HI-CAP*
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NATCO
Natco Corporation
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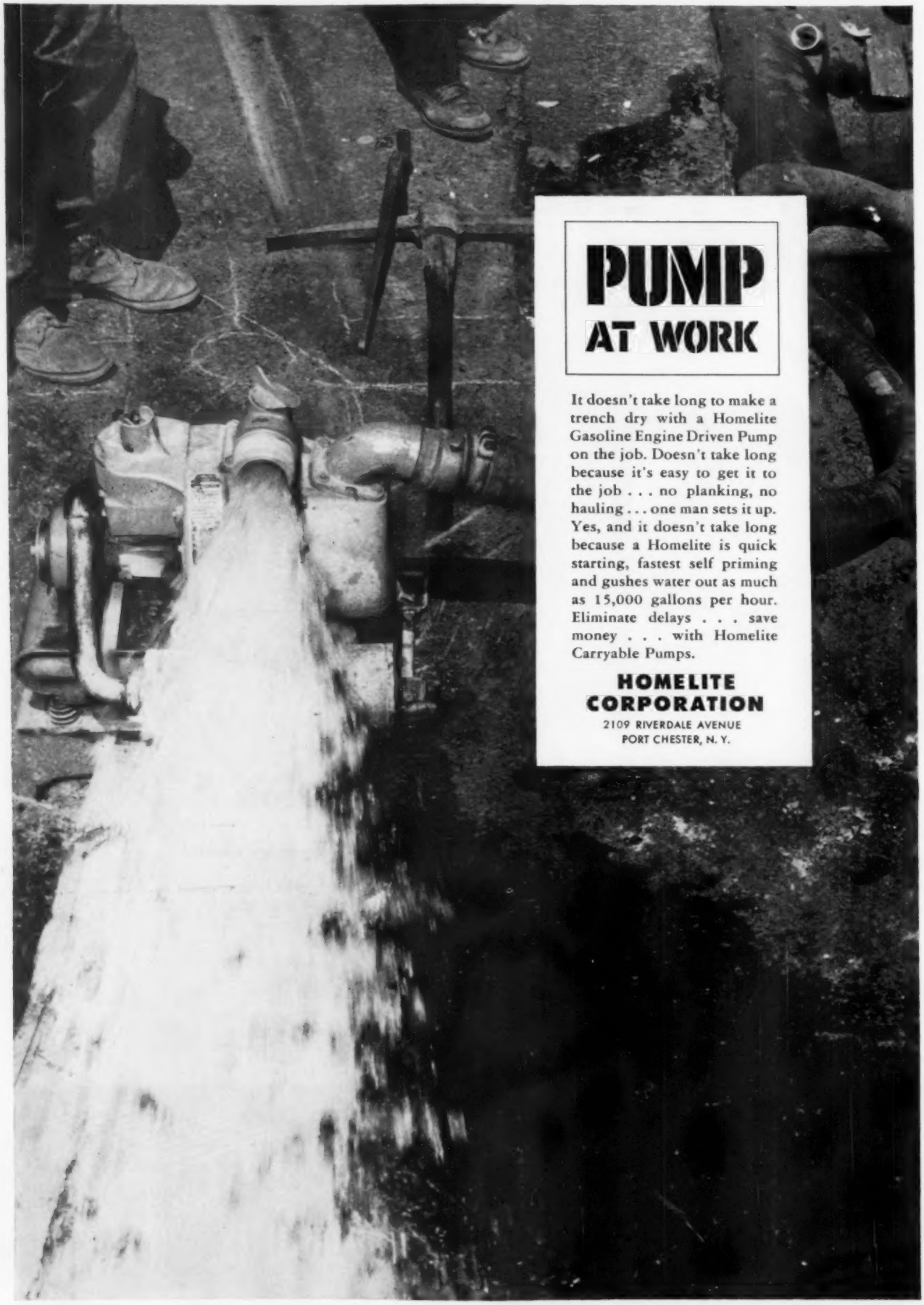
PUMP
AT WORK
It doesn't take long to make a trench dry with a Homelite Gasoline Engine Driven Pump on the job. Doesn't take long because it's easy to get it to the job . . . no planking, no hauling . . . one man sets it up. Yes, and it doesn't take long because a Homelite is quick starting, fastest self priming and gushes water out as much as 15,000 gallons per hour. Eliminate delays . . . save money . . . with Homelite Carryable Pumps.
HOMELITE CORPORATION
2109 RIVERDALE AVENUE
PORT CHESTER, N. Y.

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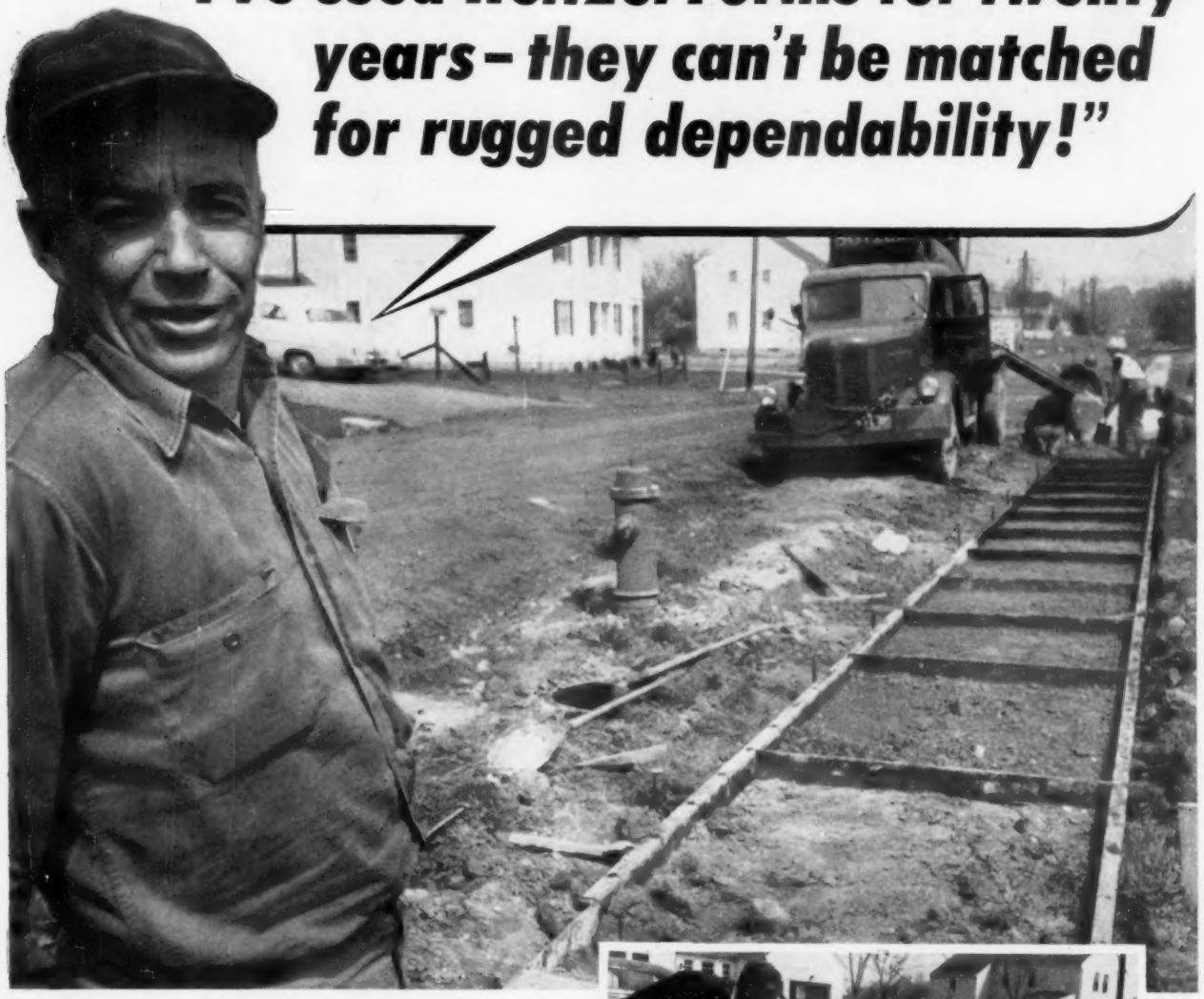
"I've used Heltzel Forms for twenty years – they can't be matched for rugged dependability!"



"Heltzel Steel Forms—both sidewalk and curb and gutter—are all they're reputed to be," states E. W. McShaffery, Ohio contractor. "They're quick setting, easy to align and they strip like they're supposed to. What's more they're built to last. I've used other makes, but none deliver the year-in, year-out service I get from Heltzel Forms."

There are hundreds of contractors like Mr. McShaffery who, through experience, know you can't beat Heltzel Steel Forms when it comes to service, dependability and extra long wear.

Make your next forms Heltzel, and you, too, will understand why more and more of America's leading contractors specify Heltzel all along the line.

Heltzel builds a complete line of sidewalk, curb, curb and gutter, highway, airport, foundation and special steel forms.

THE HELTZEL STEEL FORM & IRON COMPANY

42000 Thomas Rd., WARREN, OHIO

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

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"Our Disposal Costs Dropped from $1.25 to 60¢ per ton"

Sanford City Manager W. E. Knowles tells this story:

Area-Type Bullclam Sanitary Fill Saves Money, Reclaims Marshy Wasteland for Sanford, Florida

ROOM FOR LOTS MORE. More than 11,000 tons of refuse is dumped at fillsite annually with the "One Man Sanitation Squad" easily keeping ahead of the haul trucks.

NO FLIES, NO FIRES. At the end of each shift, compacted refuse is covered with a 12-inch earth seal to kill fly larvae and prevent rodents from burrowing into the material.

MAGICAL TRANSFORMATION. Bullclam method of sanitary landfill changes this former marshy wasteland into valuable industrial site.

Here's what W. E. Knowles, City Manager, Sanford, Florida, has to say about his community's sanitary landfill.

"We built an acre of land from a marsh with refuse during our three months of operation. With only one man and the TD-14A INTERNATIONAL DROTT *Bullclam Shovel working at our fillsite, our disposal costs dropped from $1.25 to 60¢ per ton in the same period.*

"High water level in the marshland we're reclaiming makes it impractical to excavate a trench, so we're using the area-type sanitary landfill. The area is being built up six feet by having trucks deliver refuse to the selected area where it is spread, compacted and covered by our machine.

"There are no flies, rodents or wind-blown waste and it's much cheaper and better than our old incinerator method any way you want to figure it."

INTERNATIONAL DROTT Bullclam Shovels are the only units specially designed for all sanitary landfill operations. To learn how all the residents in your community can benefit, call your INTERNATIONAL Industrial Power Distributor today. He'll help you select a site and arrange a demonstration that will show your officials the savings you will get by putting a "One Man Sanitation Squad" to work.

Remember, your INTERNATIONAL Industrial Power Distributor will call in a sanitary landfill expert to assist you in setting up a practical and money-saving sanitary landfill for your community. There is no charge for this service.

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS
DROTT MANUFACTURING CORPORATION
MILWAUKEE 8, WISCONSIN

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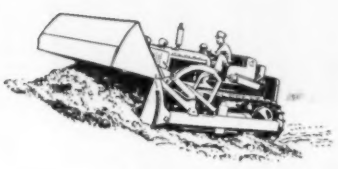
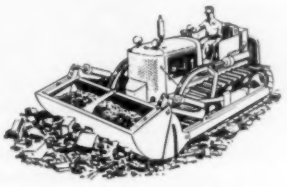
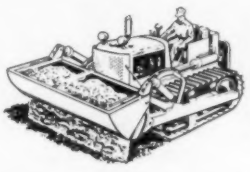
FIRM FOOTING. Refuse delivered to fillsite by City of Sanford sanitation trucks is spread and compacted effectively in marshland withminimum settling by TD-14A INTERNATIONAL DROTT Bullclam Shovel.



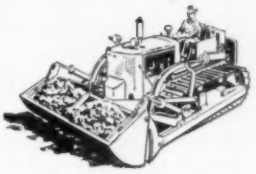
1. Prepares the site



2. Crushes and compacts refuse



3. Transports and spreads earth cover



4. Grades and levels finished area

INTERNATIONAL HARVESTER

INTERNATIONAL®

DROTT

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Cleveland "80" uses long reach, accurate pipe handling, teams up with trencher on tough 10-mile water line job

KIEFFER BROTHERS, contractors of Mount Carmel, Ill., matched their Cleveland Model 140 trencher and Model 80 side crane against 10 miles of really rough work on a 10-inch cast iron water main job in Loogootee, Ind., this winter. They report their decision paid off well in both time and money saved.

Cutting the 10-mile line through hilly terrain alongside a curving road, Kieffers' trencher maintained a fast, dependable pace overcoming frost and plenty of Indiana sandstone. Despite the tough digging in close quarters, the "140" left a clean trench ready for pipelaying.

Kieffers' "80" kept the pipelaying operation up close, usually only a couple of joints behind the trencher. The one-man-operated "80" picked up the pipe strung along the opposite side of the road, turned on its maneuverable full crawlers and accurately positioned the pipe for fast, easy installation. The Model 80's large, easy-acting hydraulic clutches and smooth handling brakes and boom hoist which placed and held pipe exactly to required positions also are responsible for its outstanding speed and accuracy when employed as a backfiller.

Cleveland's perfect operator visibility and well placed foot and hand controls, clearly shown in these photos, keep operators at top efficiency for top production all day long.

Your local distributor will show you how Clevelands do more—for less

THE CLEVELAND TRENCHER COMPANY • 20100 St. Clair Ave., Cleveland 17, Ohio

CLEVELAND

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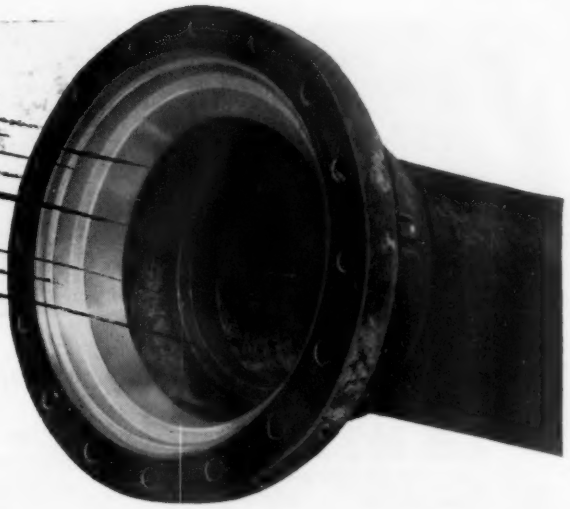
BRING ON YOUR RIVERS!



CLOW RIVER-CROSSING CAST IRON PIPE TAKES 'EM "IN STRIDE"!

EASY TO LAY. As easy to make up as a standard flanged joint. Lower labor installation cost because of ease of joint make-up and longer laying lengths.

ONLY A RATCHET WRENCH NEEDED. No split parts. Fewer parts—each joint consisting of one complete pipe, one solid follower ring, one solid ring gasket, bolts and nuts.

FULL 15° TURNING DEFLECTION with absolutely no reduction in the full internal opening area—therefore, no abnormal pressure-drops at deflected joints. Deflection stresses evenly distributed among all the bolts.

LONGER LAYING LENGTHS—approximately 18'6"—faster installation, lower costs. However, lengths may be varied to suit conditions. For example: 6 foot, 12 foot or other special lengths may be advisable to suit required curvature.

Mail coupon for complete information on Clow Ball-and-Socket River-Crossing Pipe. No obligation, naturally.

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JAMES B. CLOW & SONS
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Chicago 80, Illinois

Please send me, without obligation, details and specifications of Clow Ball-and-Socket River-Crossing Pipe.

Company_____
Street Address_____
City_____ **Zone**_____ **State**_____
Individual's Name_____
Position_____

Get full details of this month's products . . . mail your Readers' Service card today.

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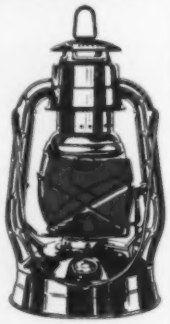
DIETZ
LANTERNS & TORCHES

DIETZ TUBULAR LANTERNS

A complete line of economical long burning kerosene lanterns available with Ruby, Clear, Blue, Green Amber Globes. Dependable, rugged quality backed by the oldest and largest manufacturer of Portable Light.

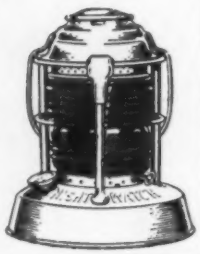


DIETZ-EMBURY "TRAFFIC-GARD" SAFETY LANTERN

"Magnified-Beam" seen for great distances. Wide, non-tip base. Long burning, economical. Stands rough usage.

DIETZ "NIGHT WATCH" SAFETY LANTERN

A miniature beacon—with new "Pencil Beam"—visible from any direction, near and far. Longest burning—over 100 hours on a pint of kerosene.



DIETZ HIGHWAY TORCHES

Complete line of bomb and flat base, Dietz *Blue* threaded collar burner models, and Dietz-Embury *Red* cam lock burner models. Tops in rugged quality.

DIETZ LANTERNS

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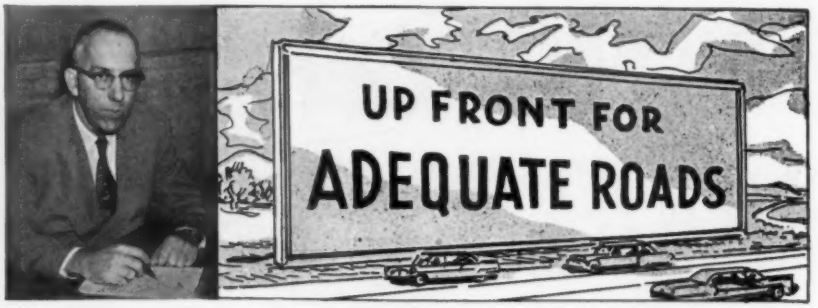

by LEO J. RITTER, JR.

For Whom the Bells Toll—A quick series of votes by the House of Representatives on July 27 killed all new federal highway legislation in this session of Congress. The action came as somewhat of a surprise, since it had appeared that the House might pass one of the three possible bills in the flurry of the last week of the session. Vote on the administration bill and its controversial financing provisions was 224-193. Vote on the Democratic "pay-as-you-go" substitute (Fallon bill), which contained several new taxes, was 292-123. These votes confirmed opinions expressed in this column several months ago, a fact which hardly makes this writer feel good. Adherents of a greatly increased highway program should not be too deeply discouraged; efforts expended in this session of Congress undoubtedly will pay off in the next session.

Bituminous Paving Mixtures—A valuable new publication of the Highway Research Board (2101 Constitution Avenue, Washington, D.C.) is *Bulletin* No. 105, "Bituminous Paving Mixtures—Fundamentals for Design." This manual was prepared by the Committee on Design of Bituminous Paving Mixtures, of which Floyd F. Rader of the University of Wisconsin is chairman. The purpose of the bulletin is to gather together current authoritative information concerning this important subject. Topics covered include properties required of bituminous paving mixtures, uses and types of bituminous paving mixtures, voids, methods of mixture design, effects of variations in aggregate, bitumen content, and characteristics of bitumen, and practice in designing these mixtures. Appendices are devoted to test procedures, including the Marshall method, use of the Hveem stabilometer and cohesiometer, kneading compaction, various specific gravities of bituminous mixtures, and skid resistance. Recommended reading for fall, especially if you haven't had time to keep up with all the recent developments in this area of highway, street, and airfield design.

Local Highway Research — Once again, and prompted by a letter from a friend who prefers to remain anonymous, we've been musing a little over the tremendous contribution which is being made toward the goal of improved highways and streets by the various state highway research groups. As most of you know, these groups usually operate administratively through the engineering facilities of the state university or college, in close cooperation with the state highway department. In some cases, the state highway department is the group which provides the spark; in others, the college. Other groups in the state usually participate, either directly or indirectly. Organizations of this sort now exist in about half the states.

Accomplishments of highway research groups are tremendous and varied. Of special significance in recent years, it seems to us, has been the contributions made toward the solution of *local* highway problems. Perhaps of greatest significance has been the work done in various places in the evaluation and improved use of local materials for construction. This has been particularly true in the field of soil stabilization. Information of tremendous value to local engineers and officials has become available in this way. More and more data of this type may be expected, as the universities *and* local engineers and officials become increasingly aware of what research is, and how applied research can be put to use by the practicing engineer in the solution of his day-to-day problems.

It should be emphasized that the local engineer or official can exert a very considerable influence upon research efforts being made in his state. In the first place, the local engineer can raise his voice in re-

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MONEY-SAVER FOR MUNICIPALITIES

Fordson Major Diesel Tractor

Municipalities—and county, township and state governments, too—are making their dollars work harder by investing them in Fordson Major Diesel Tractor power. And for good reasons!

First, this versatile tractor meets dozens of different public works needs. Almost every department can use it to save money and manpower. Equipped with a backhoe, for example, the Fordson Major will lower the cost of installing and servicing water mains and sewer connections. Equipped with a front-mounted loader, it will speed loading of sand and gravel, clean up around excavating jobs, load snow and distribute salt. Other low-cost attachments equip the Fordson Major for all sorts of lifting, hauling, mowing and grading jobs.

Next, this tractor is exceptionally easy to handle—little operator experience or training needed. It's highly maneuverable, too, for work in close quarters and inside buildings.

Best of all, the Fordson Major is priced low. You get 40.6 belt and 36.3 drawbar horsepower for hundreds of dollars less than you'd pay for competitive diesel tractors with similar power and equipment.* You'll save every day on fuel, oil and upkeep, too.

Your nearby Ford Tractor and Equipment Dealer will give you complete information about how a Fordson Major Diesel Tractor can stretch tax-dollars for your municipality. Call him soon.

***Based upon comparison of suggested list price at port of entry with published suggested list prices of competitive tractors f.o.b. factory.**

TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
Birmingham, Michigan

For better blading use a Fordson Major and rear blade to level berms, mix aggregate, grade, backfill and ditch. Fast, easy hydraulic operation.

Scarify this easy way with a Fordson Major and quick-attached implement. One man can scoop, scarify, level and backfill from the tractor seat.

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6 reasons why
Westfield, Mass. is sold on
FITCHBURG CHIPPER
FOR BRUSH DISPOSAL
William Kobuskaitis, Forestry Department, feeds City of Westfield's Fitchburg Chipper.

City of Westfield, Massachusetts

FORESTRY DEPARTMENT

June 17, 1955

Mr. W. O. Forman, President
Fitchburg Engineering Corporation
Fitchburg, Massachusetts

Dear Mr. Forman:

Westfield Forestry Department is responsible for the care of thousands of trees in this residential community. A Fitchburg Chipper was purchased in 1953 to solve the problem of brush disposal.

Owing to the fact that the City of Westfield has had extensive tree planting projects since the year 1800, Westfield has hundreds of beautiful old trees susceptible to diseases and storm damages. Dutch Elm Disease and the storms of 1954, namely the last two hurricanes, necessitated the removal of 661 trees in the past three years.

The Fitchburg Chipper has proved itself greatly in this removal work in the following ways:

1. Mainly in transporting brush to the disposal area. One load of chips from the Fitchburg Chipper replaces five loads of brush loaded on a truck. This fact enables a saving of time in trucking.
2. One man is able to keep brush going through the Fitchburg Chipper where normally two or three men were necessary.
3. The area is kept free of limbs and brush for easier working conditions. This is an ideal labor saver for limited tree crews.
4. The chips from trees that are not diseased are readily disposed of for mulch, poultry litter or stable bedding. The diseased chips are easily buried at the City dump which uses the trench system. This eliminates the old method of burning brush at the disposal area, a saving of considerable time and expense.
5. The safety spring on the knife bed is one of its best features. The tension on the knife bed which adjusts itself automatically, enables the chipping of small twigs and branches up to five inches.
6. It costs little to maintain the Chipper, only an occasional oil filter replacement and knives sent to be sharpened and balanced. We are sold on the Fitchburg Chipper.

Respectfully yours,

Benjamin Marcyoniak

Benjamin Marcyoniak
Deputy Tree Warden

Free Booklet

For information on how a Fitchburg Chipper can benefit *your* operation, send for free booklet, Fitchburg Chippers-Real Brush Eaters. Address Dept. PW-95

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

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questing the formation of such a group in his state, if none now exists; or he can urge a larger program, where the organization already exists. Secondly, the practicing engineer can be of great help to the research organization by making his problems known, by stating his research needs, and by cooperating in research efforts, as through constructing field test sections. Lastly, and probably most important, he can help by putting into practice ideas developed by the research group and by reporting his experiences to others.

A highway research program can be of great value to you, the local engineer. It will be most effective only if you provide it with your active support.

ARBA's National Conference — The tentative program for ARBA's Third National Conference of County Highway Engineers and Officials has been released. It promises to be a good meeting. The Conference will meet in Gatlinburg, Tennessee on September 12-14. Besides the usual addresses by local and national political figures, there will be many papers and several panel discussions by outstanding highway engineers and officials from all over the country. General theme of the Conference is "County Highway Administration and Management". Among the "technical" features of the program will be a panel on "County Highway Organization and Administration" and another on "Employer - Employee Relations." We were interested to note that many of the speakers and panel participants who will appear are the same people who have contributed, or will in the near future contribute, original articles for *Public Works*.

New Equipment—Two new developments in highway equipment caught our eye this month. One of these is a mobile revolving crane which features all-electric power, recently introduced by R. G. LeTourneau, Inc. of Longview, Texas. This unit is propelled by individually-powered electric wheels, each with its own drive motor. Travel, swing, steer, hoist, and boom hoist functions can be carried out simultaneously, independently or in any combination. It has integral motor brakes which set automatically and hold capacity loads whenever power is interrupted; it also has electric outriggers. The crane-shovel business, you know, is already sharply competitive and this unit is going to

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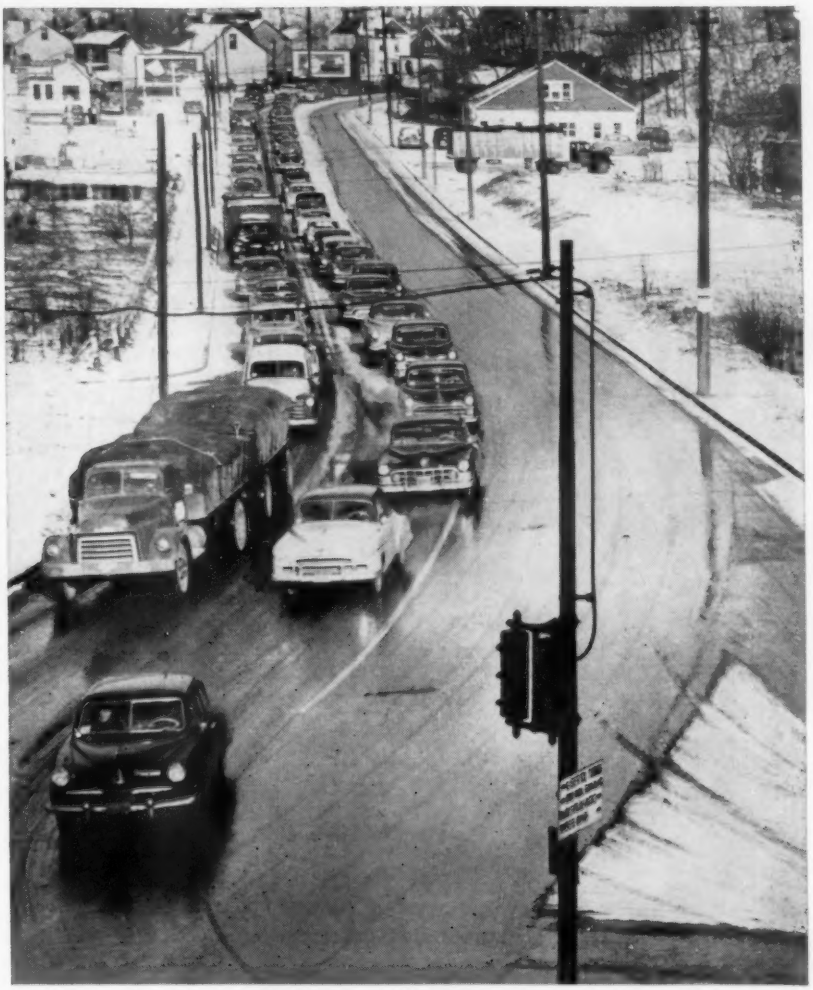
DOUBLE PROTECTION*

for icy winter streets

★SALT keeps streets clean and safe

★BANOX® stops salt slush corrosion



Inexpensive . . . Only 1 lb. BANOX needed for every 100 lb. of salt.

Easy to use . . . BANOX needs no special mixing, is evenly distributed by traffic.

Town fathers who add BANOX to de-icing salt are smart because with BANOX in the salt you get the best snow and ice control without the drawback of Salt Slush Corrosion. Many cities now using BANOX have proved its efficiency and economy.

Use the Banox-Salt team because salt is cheaper* and more effective than abrasives. With salt there is no spring clean up of sewers, gutters and catch basins, and BANOX stops salt-slush corrosion, protects cars, trucks, bridges and municipal equipment against corrosion damage.

The amount of BANOX necessary to do a thorough job is small. It takes only a pound of BANOX for every hundred pounds of salt, about 2¢ per capita per year. BANOX in salt will in no way damage concrete, black top or brick pavements.

Get double protection for your town this winter. Investigate the benefits of BANOX. Send for our free bulletin: "Stop, Look and Save with BANOX."

*Comparative cost figures for both city streets and highways indicate that you save as much as $4.27 per mile by using rock salt instead of abrasives.

calgon, inc.

HAGAN BUILDING, PITTSBURGH 30, PENNA.

SEE BANOX IN ACTION...Visit Booth No. C-5 at the APWA Show!

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You're invited to visit our Booth B-4 at the Public Works Congress, Milwaukee, Oct. 2-5.

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Low Cost Concrete Maintenance and Restoration

The AIRPLACO portable rig cuts concrete restoration and maintenance costs and helps you stretch your budget. This completely mobile unit is made up of the AIRPLACO Bondactor or Nucretor and the AIRPLACO Mix Elvator and eliminates many man-hours and saves on material costs. Aggregates are proportioned, mixed, elevated and deposited in the Bondactor by the Mix Elvator.

The Bondactor, Nucretor and the Mix Elvator are available as separate pieces of equipment. AIRPLACO concrete gunning equipment is available with capacities from ½ to 6 cubic yards of aggregate per hour.

Relieve yourself of budget problems with job-tested AIRPLACO equipment. Whatever your concrete restoration needs, you can do it faster, better and at lower cost with AIRPLACO equipment.

Write today for complete information. State intended use and capacity desired.

AIRPLACO AIR PLACEMENT EQUIPMENT CO.
1013 W. 24TH ST. ● KANSAS CITY 8, MO.
MANUFACTURERS OF ADVANCED DESIGN CONCRETE GUNNING EQUIPMENT

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fan the fires of competition. The other new development is the strengthening and modification of a "rotary flail" by the California Department of Highways, as described in a recent issue of *California Highways and Public Works*. A rotary flail is a farm tool used for mowing, shredding, and pulverizing. It is a tractor-drawn machine which consists of a series of rotating flails operating within a steel housing. The machine passes over the top of the ground and cuts and pulverizes everything it contacts. Modifications of the machine, as commonly used on farms, included structural reinforcement, addition of an engine to drive the flails at a constant speed, independent of the tractor speed, and addition of a hydraulic system to raise and lower the flails. Tests have shown the unit to be very successful in weed and brush removal, particularly in heavy growth.

People You Know—Our old friend, A. O. Williamson, has been elected to the board of directors of the Wm. Bros Boiler and Manufacturing Company. With the company for 20 years, Mr. Williamson started as chief draftsman of the road machinery division and later became manager of the division . . . Twenty-five instructors and professors, from 23 states, attended the special program given at the Institute of Transportation and Traffic Engineering at the University of California during the summer. The program was made possible by grants from the automotive Safety Foundation and the Highway Research Board. Included among those attending was another old friend of ours, Walt Zimpfer of the University of Florida . . . Turnovers in the top state highway department jobs have been unusually high in the last few weeks—new top officials include L. P. Zimmerman in Minnesota, F. L. Davis in Virginia, Virgil Smith in Indiana, and W. E. Willey in Arizona.

● ● ●

Property Owners Must Pay for Sewer and Water Extensions

All of the cost of extending sewer mains 8 ins. in diameter or smaller and of water mains 6-in. or smaller must be paid for by property owners in Xenia, O. Costs for larger pipe are paid for by the city. Property owners outside the city limits must pay for the construction of new lines needed to serve them before connections are permitted. Rates for water and sewerage service outside the city limits are 50 percent higher.

Now's the time to mail this month's Readers' Service card.

NOW...waste treatment is "packaged" for you!

An industrial waste treatment plant...complete in a package...that's the great, new, efficient answer developed by CHAIN Belt to clarify plant water, eliminate pollution and reclaim process water and valuable materials. The new Rex® Steel Tank Verti-Flo® is shipped ready for use...just pipe it into plant sewer lines.

Bulletin No. 315-92 gives you all the facts...shows you how simple and efficient this new unit is. It shows why the Verti-Flo design is ideal for industrial waste treatment with its ability to cut detention times...reduce tank sizes ...assure maximum clarity. It illustrates the flexibility of Verti-Flo®...how it can be easily arranged to recover valuable materials and simplify disposal of waste solids.

Send for your copy today and also informative booklets on the other Rex equipment for efficient waste treatment. Simply mail the coupon. There is no obligation.

CHAIN BELT COMPANY

Milwaukee 1, Wisconsin

CHAIN Belt Company 55-211
4722 W. Greenfield Ave.
Milwaukee 1, Wis.

☐ Send me my copy of Bulletin No. 315-92 on Packaged Verti-Flo Clarifiers.

☐ I would like data on other Rex waste treatment equipment.

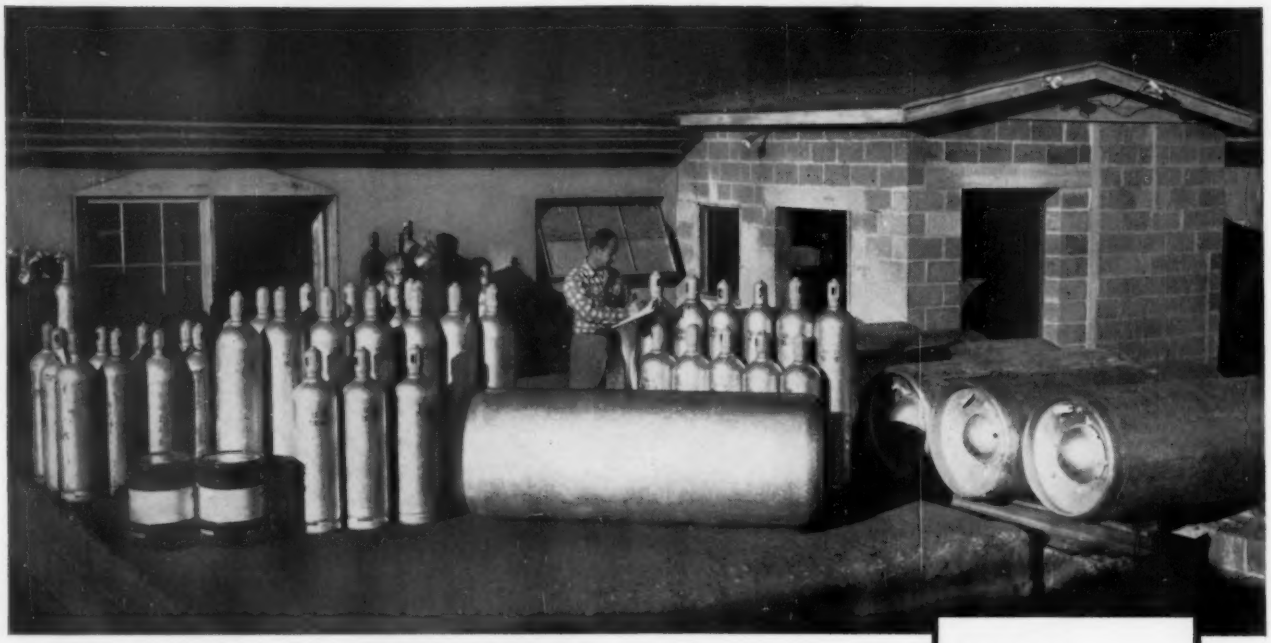
Name.....

Title.....

Address.....

City.....*Zone*....*State*.....

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.



AT EACH of the five Jones Company plants, Chlorine is received in tank cars, repacked in smaller containers selected to meet the customer's needs.

Save storage space and shipping time on your next CHLORINE purchase!

GET FAST DELIVERY ON *MANY* CHLORINE PRODUCTS IN WHATEVER CONTAINER BEST FITS YOUR NEEDS

Stop the cost and nuisance of storing huge amounts of Chlorine. Buy only what you need—whether it's several carloads, just part of one tank car, or as little as 16 lbs.!

You can get less-than-carload shipments of Chlorine from John Wiley Jones. And you get them quickly, because Jones has five distribution centers spotted in important locations around the country, each one ready to make delivery within a matter of hours in many cases.

Eliminates searching

You save searching time, too, because you have a *single* convenient and dependable source for *all* your Chlorine products—liquid Chlorine, Calcium Hypochlorite, and Sodium Hypochlorite.

Cylinders, tins, drums, carboys, and ton-tanks—Jones delivers in any type of container you require. This flexibility, plus the speed of Jones' deliveries, gives you complete protection against sudden emergency needs for Chlorine.

Top quality

Jones Chlorine is quality controlled to meet high government standards. Municipalities, public utilities and industrial users have relied on Jones Chlorine for a quarter of a century.

Dependable

We supply more municipalities than all other Chlorine packers combined.

Our trained technical staff will be glad to help you solve *your* Chlorine problem. Take the waste out of your Chlorine buying. Do it now! Write for prices.

LIQUID CHLORINE

In 16-, 105-, 150-lb. cylinders and 1-ton tanks.

CALCIUM HYPOCHLORITE

(70% available Chlorine) In 3¾- and 5-lb. tins, 100-lb. drums.

SODIUM HYPOCHLORITE

In gallons, carboys. Tankwagon deliveries in 1000-3000 gal. lots

JOHN WILEY JONES CO.

100 Sunny Sol Blvd.
Caledonia, New York
Tele—Caledonia 84, 79, 4

1904 Border Ave.
Torrance, Calif.
Tele—Fairfax 8-6383

600 Bethel Ave.
Beech Grove (Indianapolis), Ind.
Tele—Idlewood 1443, 1444

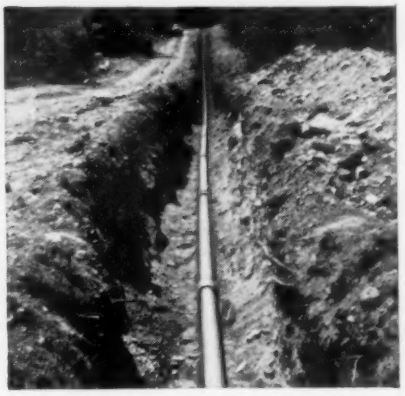
2365 Dennis St.
Jacksonville, Fla.
Tele—Elgin 4-5503 6-3321

610 McNinch St.
Charlotte, N. C.
Tele—6-7790

Need more facts about advertised products? Mail your Readers' Service card now.

Seafaring durability! K&M "Century" Pipe "goes to sea" on the Padre Island causeway pictured here. The island is located off the Texas mainland. Engineers: Parson, Brinckerhoff, Hall and Macdonald, New York. Installation contractor: W. T. Liston Co., Harlingen, Texas. Photo by Booth Studio.

In the South! "Century" Pipe is shown here at the beginning of the Padre Island causeway—a span that stretches out from the coast of Texas into the Gulf of Mexico for a mile and a quarter.



In the east! This picture illustrates an installation of "Century" Pipe at the Brookwood Estates, Stanhope, New Jersey.

Over the Sea, as across the Land

K&M "Century"® Pipe Keeps Pumping Costs Low!

Off the coast of Texas, the "Century" Pipe on the causeway pictured above prevents pumping costs from creeping up—there's never a change in the diameter of its bore! Why? This asbestos-cement pipe is non-tuberculating, highly resistant to corrosion, and immune to electrolysis.

Formed on a smooth steel mandrel, its interior surface offers a minimum of friction. The Williams and Hazen Constant "C" is conservatively placed at 140. As this pipe is relatively light in weight, handling and installation costs are low. It also meets the A.W.W.A., and A.S.T.M., and Federal specifications for asbestos-cement pressure pipe.

Contraction, expansion controlled. The "Century" Simplex Coupling acts as an expansion joint. Each pipe length "floats" within its own couplings. Thus, any contraction or expansion need is readily met. Furthermore, these couplings actually absorb traffic vibration.

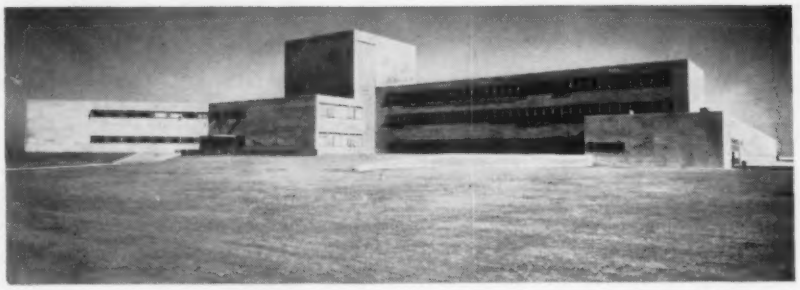
Booklet on request! Write for your copy of "Mains Without Maintenance" . . . complete specifications and background data for K&M "Century" Pipe. There's no obligation, of course.

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos®

Thousands use our Readers' Service card to keep up to date . . . do you?

Use Northern Gravel for Rapid Sand Filter



The South District Filtration Plant of the city of Chicago, is the largest in the world. Northern Gravel Company furnished them 422 carloads with clocklike regularity, enabling installation continuously and economically

Filter Sand Specifications

are carefully laid out. The Effective Sizes and Uniformity Coefficients used by Consulting Engineers and also recommended by the American Water Works Association are the result of long years of research and experience.

The Northern Gravel Company is equipped to give you prompt shipment whether it be one bag or many carloads, exact to specifications. Filter sand can be furnished with any effective size between 0.35 MM and 1.20 MM.

Chemical Quality

of the filter sand is also important. It must be hard, not smooth, and free of soluble particles. This requires perfect washing and grading facilities. We have every modern device for washing, drying, screening and testing.

Filter Gravel

supporting the Filter Sand Bed, must be in turn, properly graded to sizes calculated to support the Filter Sand, and be relatively hard, round and resistant to solution.

Northern Gravel has no equal in facilities and our reserves of both sand and gravel are inexhaustible. Northern Gravel Company has been in business over 40 years. We guarantee uniformity of products and our records enable us to duplicate your requirements on short notice. Our location is central and we have commodity rates in every direction.

Northern Gravel Company
Muscatine, Iowa

Box 307 Ph.: Amherst 3-2711

Now's the time to mail this month's Readers' Service card.

RAILWAY GRADE CROSSINGS

We, of the City of Cedar Rapids, Iowa, have had continuous difficulty in the fact that several large railroads have trackage directly through our business area.

It has always been a source of difficulty to attempt to maintain decent crossings in this area. The City Council has recently authorized me as a member to obtain all recommendations from any source possible for a semi-permanent or permanent crossings that can be constructed to alleviate this situation.

You, being in the public works eye, should certainly have some data on these crossings. I would certainly appreciate any information of any permanent crossings that have been constructed, or are being constructed, or that are in the trial stages.

W. W. Stolba,
Commissioner of Streets
& Public Improvements
Cedar Rapids, Iowa

Editor's Note: We hope those of our readers who have found effective methods of combating this problem will write Mr. Stolba, sending a copy of the letter to the Editor of PUBLIC WORKS.

• • •

Efficiency of Clarifier Operation

Clarifier operation in the Greater Winnipeg Sanitary District, Winnipeg, Man., in 1954, resulted in an average BOD removal of 48.1 percent, with an average raw sewage BOD of 260 ppm and an average effluent of 135 ppm. Removal of suspended solids averaged 64.9 percent, with influent at 285 ppm and effluent at 100 ppm. Monthly ranges of BOD removal were from 46.2 percent (in January) to 56.1 percent (in April); and of SS from 54.4 percent (in November) to 70.8 percent (in July).

Thousands use our Readers' Service card to keep up to date . . . do you?

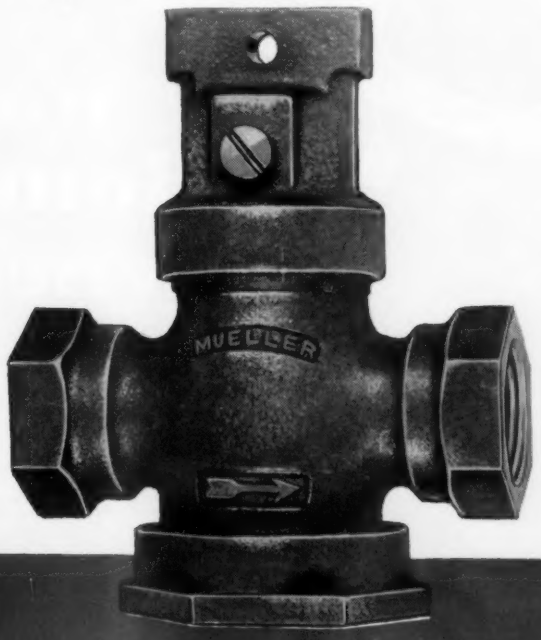
MUELLER®

IMPROVED CURB BOX

Telescopic upper section prevents damage to stop, line or box from heavy loads . . . upper section held in any position by strong phosphor bronze spring . . . allows for grade changes, settlement or frost heave . . . cannot be pulled out of base . . . bronze-bushed lid assures easy removal of access plug at all times . . . curb box completely coated with tar base enamel . . . for stops in sizes from ½″ through 2″ . . . lengths from 2′ through 6′ . . . optional foot-piece centers stop and provides solid support for curb box.

INVERTED KEY CURB STOP

Tapered key individually ground and lapped for perfect pressure-tightness . . . key seated by base cap *and* water pressure . . . increase in water pressure automatically increases key-seating force . . . key is unseated for easy turning with downward pressure on shut-off rod . . . pressure instantly reseats key . . . combined cap and tee has accurate built-in check . . . all parts cast from finest waterworks bronze . . . various combinations of inlets and outlets for any type, or types, of service pipe . . . sizes from ½″ through 2″.



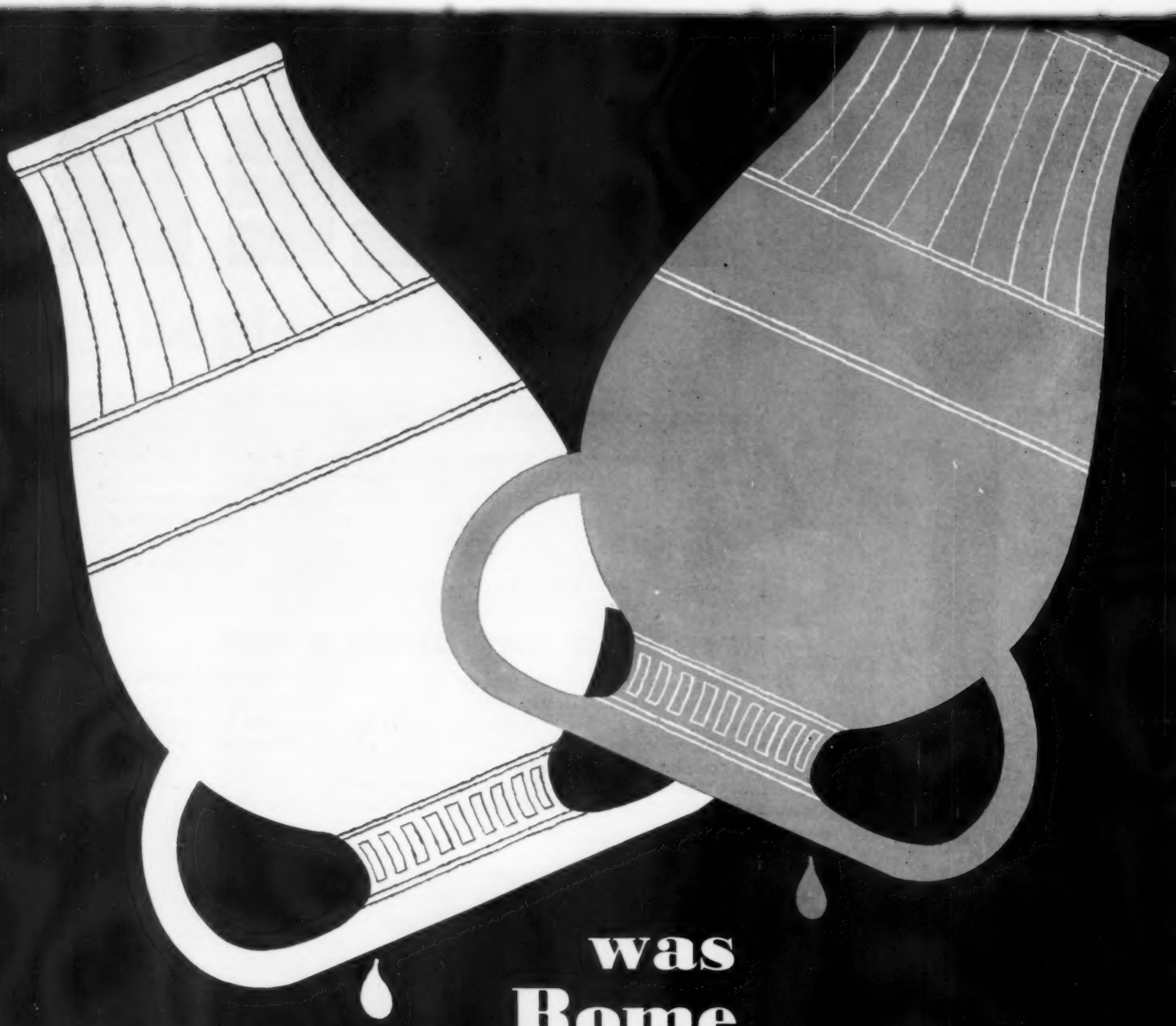
See your Mueller Representative, Catalog W-96 or write direct for detailed information on Mueller's full line of curb stops, curb boxes and related waterworks products.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

Get full details of this month's products . . . mail your Readers' Service card today.



was Rome burned *up!*

Not the city, mind you, for this was before the days of the Nero caper, but the people — they wanted water. Summers were getting hotter and Romans were getting thirstier. They needed something to drink — with or without calories. Thus began the construction of Rome's famous aqueducts, one of which, scarred but faithful, served the city for almost nine hundred years!

These early aqueduct builders had more to contend with than their thirst. For one thing, they had to carry the ball alone. No skilled specialists or professional consultants stood ready to provide their answers. Today, carrying the ball alone is almost as defunct as the aqueducts themselves. Experienced consulting, design and operating engineers — each contributing his unique skills — cooperate in solving complex water and waste problems that would have amazed the early Romans. Graver believes this interrelation is not only useful but desirable and that all involved can not help but profit by it.

GRAVER

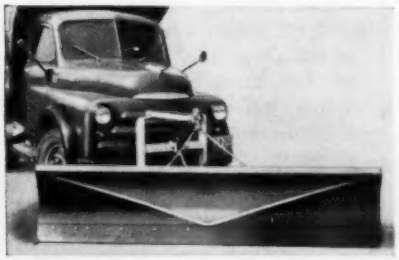
GRAVER WATER CONDITIONING CO.

Get full details of this month's products . . . mail your Readers' Service card today.

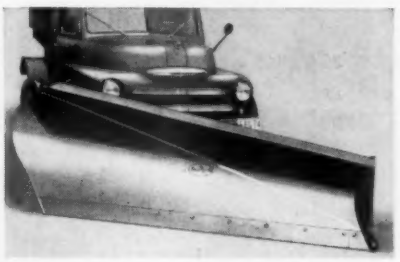
Good Roads "Champion" Snow Plows and "Jet" Spreaders

Banish Winter Road Hazards...

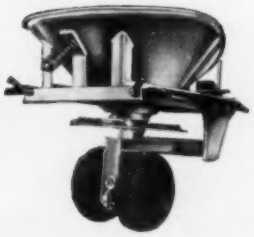
V-PLOW—for high speed, tough going in deep snow—left or right hydraulically operated wings optional—in sizes for jeeps to 10-ton trucks.



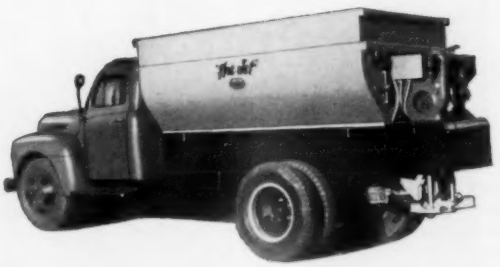
REVERSIBLE BLADE PLOW—Adjusts to 5 plowing angles—straight push and left or right. Used in small and congested areas, parking lots, etc., on medium and small trucks—in sizes for jeeps to 10-ton trucks—equipped with Good Roads Safety Blade Trip.



ONE WAY PLOW—For high speed, capacity and safety—ideal for open highway use—3 plowing angles—adjustable vertical pitch—in sizes for jeeps to 10-ton trucks—equipped with Good Roads Safety Blade Trip.



THE LOW-COST 4-U SPREADER—fits any dump truck—adjustable spread up to 270°—variable width control—available in 5 sizes.



THE "JET" SPREADER—In addition to 5 standard models, is available for special applications for mounting on dump bodies, stake or special chassis—used for spreading salt, sand, cinders, calcium chloride, seal-coating and aggregate.

For high-speed removal of heavy drifted highway snow . . . or snow control on city streets . . . you'll find Good Roads "Champion" plows the most economical and efficient weapons to combat natures' challenge. Included in the "Champion" line are snow plows for heavy, medium, and light prime movers.

For quick, efficient ice and sleet control, Good Roads line of "Jet" spreaders are designed to overcome the toughest icing conditions. Fast action, maneuverability, wide coverage and accurate spread control, important to fast control of icing, is built into all models in the "Jet" line.

FIVE STANDARD MODELS, in various sizes:

JET ACE—Gasoline Motor Driven, Twin Spinner, Electric Cab Controls.

JET KING—Gasoline Motor Driven, Twin Spinner, Cable Cab Controls.

JET QUEEN—Gasoline Motor Driven, Single Spinner, Cable Cab Controls.

JET JACK—Power Take-Off Driven, Single Spinner, Cable Cab Controls.

JET HYDRAULIC—Full Hydraulic operation on conveyor and spinners, cab controlled, powered from power take-off through Hydraulic pump.

For complete details on how Good Roads snow and ice control equipment can help you overcome winters' hazards, write to:

THE GOOD ROADS MACHINERY CORPORATION
MINERVA, OHIO

SNOW PLOWS

ICE CONTROL SPREADERS

ESTABLISHED 1878
Good Roads MACHINERY CORPORATION

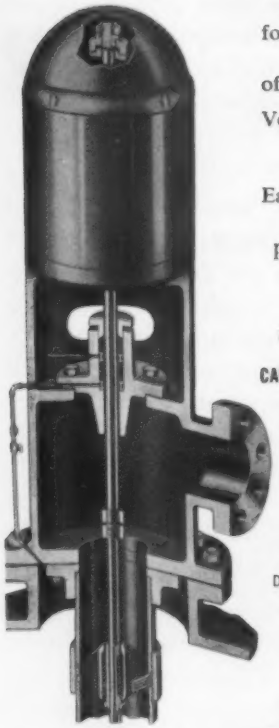
AGGREGATE AND ASPHALT SPREADERS

LEAF COLLECTOR

SCAVENGER

Need more facts about advertised products? Mail your Readers' Service card now.

Verti-Line
CLOSE-COUPLED PUMPS
for every Industrial Vertical Pump Installation



The Verti-Line Close-Coupled Pump is not just another deepwell pump adapted to industrial service. It is designed and engineered for such jobs as booster service, fire protection, cooling, transfer and general service pumping of water and other fluids, corrosive or non-corrosive.

Verti-Line Pumps are made to the highest standards of quality in workmanship and materials to assure a *precision built* product. Each unit is thoroughly tested and rigidly inspected, insuring ease of field assembly and perfect performance—guaranteed to meet the most exacting specifications.

Whatever your vertical pump needs, investigate Verti-Line Pumps before you buy.

CAPACITIES FROM 20 GPM TO 30,000 GPM—HEADS TO 600 PSI

Heavy-Duty Fabricated Discharge Head With Solid Shaft Motor

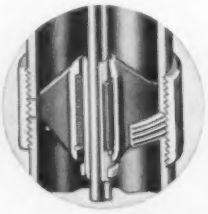
In-Line "T" Type Fabricated Discharge Head With Hollowshaft Motor

Standard Discharge Head With Combination Gear and Motor Drive

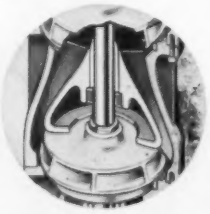
TYPICAL CONSTRUCTION FEATURES

(Open lineshaft type . . . Enclosed lineshaft also available)

The packing assembly is simple and effective. It is easily accessible and consists of a packing container, lantern ring, packing rings, pressure relief bushing, gland, fluid by-pass and lubrication fittings. Mechanical shaft seals also available.



Outstanding feature of bearing assembly is removable stainless steel shaft sleeve. This prevents shaft wear and bearing journal corrosion, and is easily replaced without special tools. You simply remove the old and slip on the new which is secured by a stainless steel collet.



Dual bowl bearings of rubber and bronze are supplied in most open and enclosed lineshaft pumps. Extra stability and resistance to abrasives mean longer life.

Send for your free copy of our new booklet, "Pumps for Sale." Ask for Bulletin 1-95.

Verti-Line Pumps are the exclusive products of

LAYNE & BOWLER PUMP COMPANY

general offices and main plant

2943 VAIL AVENUE • LOS ANGELES 22, CALIFORNIA

Thousands use our Readers' Service card to keep up to date . . . do you?

Leader in Public Works

★

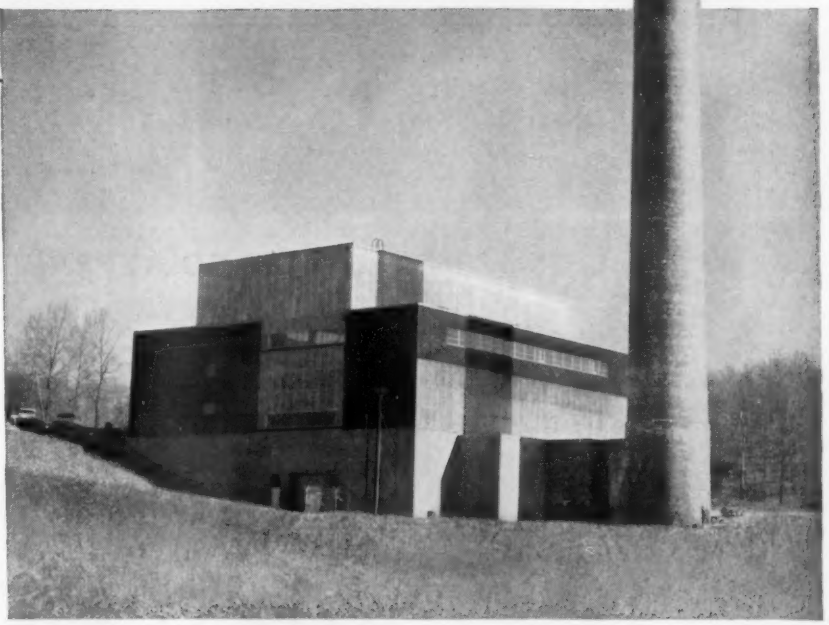
Henry D. Harral is Street Commissioner, Department of Streets, Philadelphia. As such he has a tremendous job to do. This job includes highway surveys, traffic engineering, street lighting, street cleaning and refuse collection and disposal. Over the past 3 years, he has been Street Commissioner and before that Deputy Commissioner for Sanitation. Prior to coming with the city, he was for seven years with the Institute of Local and State Government of the University of Pennsylvania. Other experiences have included City Manager of Lewistown, Pa.; engineer of the highway department and planning engineer for Lower Merion Township, Pa.; five years with an engineering firm; and early experience, just after graduation, in Haverford Township. The article in this issue by Mr. Bailey illustrates some of the fine work being done in Philadelphia in, as Mr. Harral says, "the area of municipal management and public works and in the training of others in that field."

Mr. Harral was graduated from Pennsylvania State College in 1924 with the degree of BS in CE and in 1939 received his CE degree. He has been active in the American Public Works Association, the International City Managers' Association and the American Society of Planning Officials. His hobby is the collection of map stamps. He and Mrs. Harral have a son, a graduate in Public Administration (who is now in the Army) and a very small granddaughter.

Need more facts about advertised products? Mail your Readers' Service card now!

Another Norton Rx *on the job!*

CRYSTOLON refractories specified for furnace lining and other critical areas in new, million-dollar municipal incinerator*



This new $1,000,000 incinerator — designed by Anderson-Nichols & Co. of Boston, Mass., Consulting Engineers, with equipment designed and constructed by Nichols Engineering and Research Corp., New York, New York — is one of the country's newest and most modern. Norton CRYSTOLON refractory shapes have important uses in its combustion system.

CRYSTOLON refractory brick and special shapes, shown around a furnace access door comprise one of the Norton Rx's — *engineered and prescribed* refractories — in the new incinerator. CRYSTOLON brick also lines the interior walls up to about three feet above the grate line, and is further used in the settling-out area, between the combustion chambers and stack.

Another good example of how designers and builders of the most modern incinerator and power plants are specifying Norton *engineered and prescribed* refractories.

In this big new incinerator CRYSTOLON brick and special shapes are used around the access door and interior of the furnace, as shown. CRYSTOLON brick is also used, in both solid and checkered construction, to make up the baffle walls in the settling-out area.

CRYSTOLON refractory material in the furnace areas provides great resistance to slag caused by bottles, cans and other abrasive refuse. In the baffle walls it is valuable for its ability to reduce erosion due to fly ash. And in all locations it will withstand temperatures up to 3050°F . . . combines great physical strength with exceptional resistance to thermal shock, slag penetration and chemical attack . . . and has up to 15 times the resistance of ordinary fire clay to erosion and corrosion.

Investigate Norton Rx's

for your own furnace operations. Learn how they can save you time, work and money. See your Norton Representative or write to NORTON COMPANY, Refractories Division, 228 New Bond Street, Worcester 6, Mass. Canadian Representative: A. P. Green Fire Brick Co., Ltd., Toronto 5, Canada.

NORTON

REFRACTORIES

Engineered... Rx... Prescribed

Making better products... to make your products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Now's the time to mail this month's Readers' Service card.

BE SURE TO ATTEND
the
MILWAUKEE SHOW
October 2-5, 1955

★

AMERICAN PUBLIC WORKS ASSOCIATION
1313 E. 60th Street
Chicago 37, Illinois

(The surrounding pictures were selected by the Association at random from those taken at last year's show.)

Quality
Dependability
...my

CATERPILLAR ANNOUNCES

2 NEW

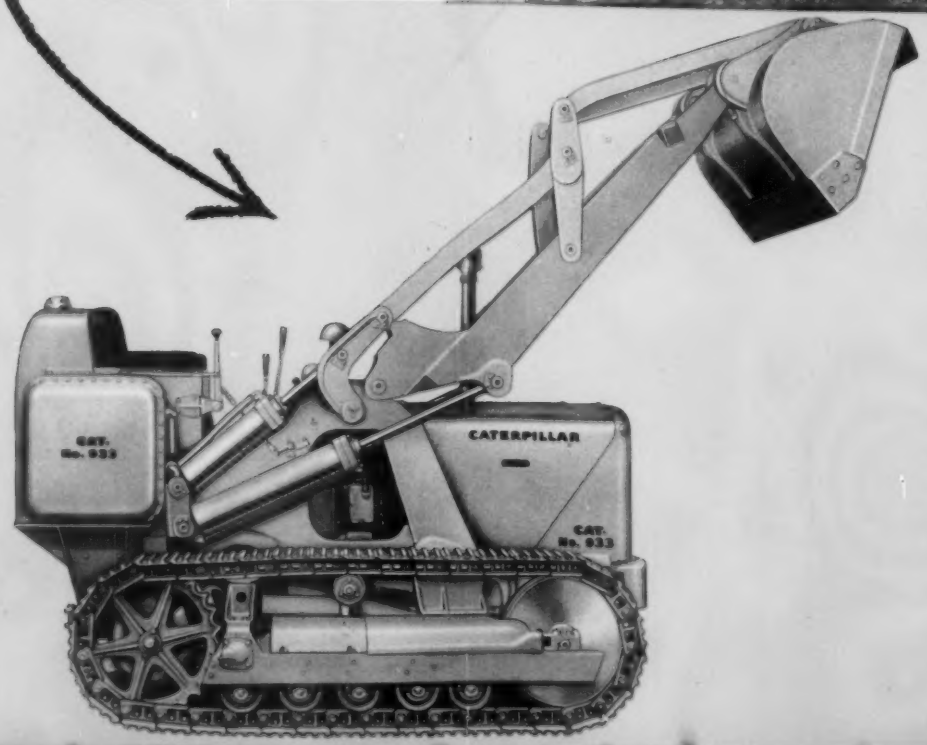
TRAXCAVATORS

CATERPILLAR LEADERSHIP IN ACTION

NEW No. 955

1½-yd. capacity

Balanced units for bigger profits!



"Big production" features of the new CAT No. 955 and No. 933 Traxcavators

40-DEGREE BUCKET TIP-BACK AT GROUND LEVEL. Tip-back action at low bucket height results in maximum possible loads every pass in any material—bigger production per day!

NEW OIL-TYPE CLUTCH. Stands up under continuous repeated use. Cuts maintenance costs and time two ways. (1) Clutch adjustment, while easy, is seldom required. (2) Plate replacement is often unnecessary even at engine overhaul.

Also helps step up production by providing easier shifting for operator!

MODERN HYDRAULIC SYSTEM. Hydraulically balanced vane-type pump insures delivery of full volume and pressure of oil for thousands of hours. Control valves located in tank receive maximum protection against damage and dirt. Closed hydraulic system—no vents or breathers—prevents entrance of dirt. Full-flow hydraulic system filter protects moving parts against abrasive particles in fluid. Filter handily located for easy replacement of element!

PLENTY OF POWER. Power is ample to "bury" the bucket and provide fast lifting action and positive dumping under all load conditions.

"DESIGNED-IN" COMFORT. Operator sits high, with excellent visibility of all bucket positions. All controls easy and convenient to operate—bucket control a one-hand operation! Pilot-house visibility —leisure-chair comfort.

PERFECT BALANCE. Weight distribution, engine horsepower and bucket capacity are balanced so that the full length of the track stays on the ground with a heaped load in the bucket.

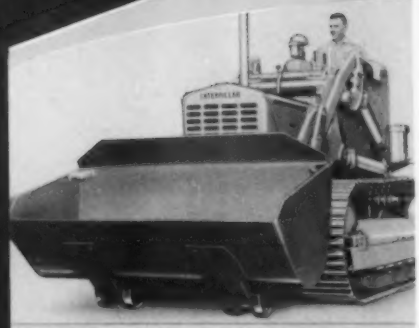
NEW 3-GROUSER TRACK SHOES. Tested and proved on tough jobs, they deliver better traction—longer life!

OPTIONAL STARTING. Your choice of 6-volt electric starting for starting engine or 24-volt direct electric starting—from the seat, either way.

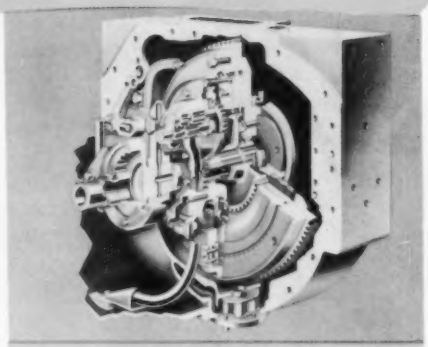
VERSATILE ATTACHMENTS. Your job range is increased by a variety of buckets and other useful attachments.

NEW No. 933

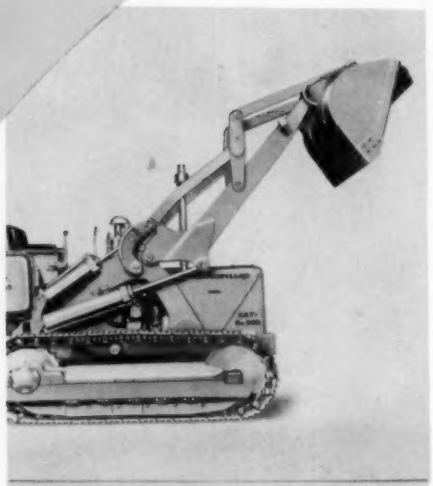
1-yd. capacity



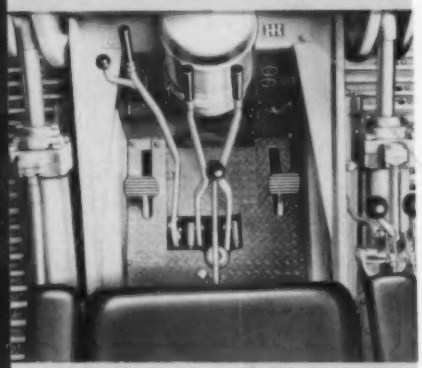
40-DEGREE BUCKET TIP-BACK AT GROUND LEVEL assures large loads every pass!



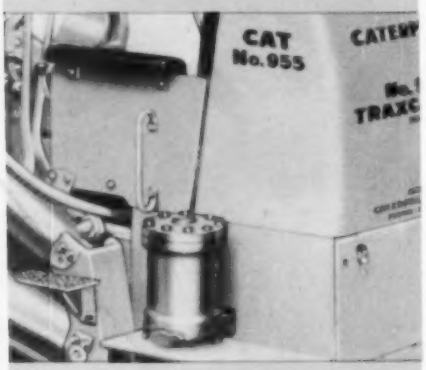
NEW OIL-TYPE CLUTCH sets new records for long life and minimum maintenance!



HIGH REACH with box-section lift arms for rugged service. Cross brace prevents twisting!



CONVENIENTLY LOCATED LIFT AND DUMP LEVERS provide one-hand operation!



HYDRAULIC FILTER IN HANDY LOCATION affords easy replacement of the element!

BRIEF SPECIFICATIONS

	No. 955	No. 933
Flywheel HP at sea level	70	50
Bucket capacity, cu. yd.	1½	1
Bucket tip-back at ground level, degrees	40	40
Bucket tip-back at max. lift, degrees	47½	48
Dumping height (center of hinge pin to ground)	128″	118½″
Weight (approx.) lb.	21,480	15,500

—AND MANY OTHER FEATURES!

Balanced for more work at less cost...

The new Caterpillar No. 955 and No. 933 Traxcavators

Designed from the ground up as excavating and loading machines, the new CAT* No. 955 and No. 933 Traxcavators are balanced *units*. Built and backed from tracks to buckets by *one* manufacturer, they also give you advantage of *one* service source—your nearby Caterpillar Dealer. With practical, advance-design features, they're engineered to *outproduce* ordinary tractor-shovels of equivalent size. You'll find these versatile units the handiest tools in your equipment line-up. Get the money-making picture from your Caterpillar Dealer—ask for a demonstration!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

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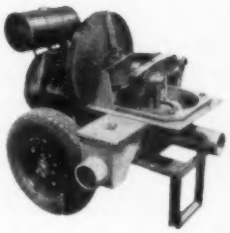

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FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Calcium Chloride for Roads

98. A 24-page booklet "The Why of Wyandotte Calcium Chloride for Roads" is available from Wyandotte Chemicals Corporation, Michigan Alkali Division, Wyandotte, Michigan. The booklet explains in copy and pictures why calcium chloride has become so widely adopted for the treatment of unpaved road surfaces. Also, such topics as elimination of gravel loss and reduced blading are covered. Check coupon for your copy.

Water, Waste and Sewage Treatment Equipment

130. A bulletin containing photographs, drawings and descriptions of water, waste and sewage treatment equipment has just been released by Walker Process Equipment Inc., P. O. Box 266, Aurora, Illinois. The bulletin is attractively printed in two colors and serves as an excellent introduction to this firm's coverage of municipal and industrial treatment processes. Check the coupon today.

Valuable Bulletin on Soil Testing Equipment

158. A twelve-page bulletin on complete line of Karol-Warner physical soil testing equipment is now available. Information on description, specifications and types of equipment used in the analysis of subsoil physical characteristics and rapid determination of soil characteristics at the construction site is included. For your copy of Bulletin 50, write Tinius Olson Testing Machine Company, Easton Road, Willow Grove, Pa., or check the coupon.

Catalogs on Street Sweepers and Flushers, Bituminous Distributors and Maintenance Units

402. Catalogs which feature photos and detailed specifications of street sweepers and flushers and bituminous distributors and maintenance units have just been released by the Municipal Supply Co., 2508 South Main Street, South Bend 23, Indiana. Standard and optional equipment are listed for each piece of machinery. Get your catalogs by checking the coupon.

Self Cleaning Screen for Primary Sewage Treatment

407. Information on the North sewage disposal screen can be had from Green Bay Foundry and Machine Works, Green Bay, Wisconsin. The advantages and operation of the screen are outlined. Specifications as to size of wire mesh, capacity, and motor are included. Check the coupon.

Jeffrey Traveling Water Screen

431. Information has just been released on the Jeffrey traveling water screens by the Jeffrey Manufacturing Co., Columbus 16, Ohio. These screens are designed for positive removal of floating debris and suspended matter from power station and water treatment plant influent. Each traveling panel is made up of a fine mesh wire screen basket and as each panel in its upward travel carries refuse from the channel, it is thoroughly washed off by means of a high pressure water spray directed through the screen from the downstream side of the basket. For more information check the handy coupon for Bulletin No. 885.

Stop Sewage and Garbage Odors

434. Be sure to investigate this sanitation chemical that is used to stop odors in sewage treatment plants and at garbage disposal dumps and from garbage trucks. Full data from Fine Organics. Inc., 211 E. 19th St., New York 3, N. Y., or check the coupon.

Taste and Odor Removal Without the Use of Chemicals

253. A four-page bulletin explaining a new method of high iron, gas, taste and odor removal, without the use of chemicals is available from Aquatrol Ferr-X Corporation, Clifton, N. J. This non-chemical single pumping, closed pressure system is equally effective for open aeration or second pumping without settling requirements. Check the coupon today for the bulletin.

Tight-Closing Rubber-Seated Butterfly Valves

408. A 4-page color bulletin offered by Builders-Providence, Inc., Division of B-I-F Industries, Inc., Providence, R. I., gives a complete description of butterfly valve components, sizes, pressures and velocities. In addition to photos and drawings, there are major sections on valve operators. Check the coupon for your copy.

Motion Picture on MF Millipore Filter Available

411. The nature and properties of the new Millipore membranes and techniques of application in a wide range of analytical procedures is now available on a 20 minute, full color, 16 mm sound motion picture upon request from the Publications Department, Millipore Filter Corporation, 36 Pleasant Street, Watertown 72, Massachusetts. The film demonstrates the simple MF procedures of bacteriological water analysis and various microbiological procedures and includes the monitoring of radio-active dust and other airborne health hazards. Check the handy coupon today.

Pre-Pack Refuse Loader For Commercial or Residential Use

412. Complete information is available from the Herman Body Company, 4400 Clayton Ave., St. Louis 10, Missouri, on the Herman Ram-Pak automatic pre-pack refuse loader. All mechanism straight hydraulic with no springs and solenoids. Body is 10 gauge steel with a 16 cubic yard capacity and pressure locked square doors on both sides. For more information check the handy coupon.

Air Release Valves For Water, Sewage and Industrial Use

415. A colorful 8-page Bulletin No. 1204 is offered by the Simplex Valve and Meter Company, 7 East Orange Street, Lancaster, Pa., describing the functions of their automatic air release valves. Listed in the bulletin is information on essential requirements, methods of installation, operation, construction, uses, weights and dimensions. For your copy, check the coupon.

Bituminous Concrete Tables For Highway Engineers

423. A copy of N. S. A. Bituminous Concrete Tables is available from the National Slag Association, 613 Perpetual Building, Washington 4, D. C. Design and control of bituminous concrete mixtures and recommendations and suggested grading specifications are fully covered. Also, aggregate grading for optimum density for hot-mixed, hot-laid asphaltic concrete and other valuable information on bituminous concrete are included. Check the coupon for your copy.

9-55

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

STOP READ AND SEND

Booklets from pages 40 to 58

20	27	33	35	37	40	41	42	43	44
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New Products, pages 190 to 195

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PIPE LINE EQUIPMENT

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SERVICE SADDLE

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Made of malleable iron. Single massive bolt. All sizes, 1/2" to 12" inclusive. For steel, cast iron and Transite pipe.

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To order these helpful booklets check the coupon on page 40.

NEW LISTINGS (Cont.)

Ice Control
Spreading Equipment

426. The Baughman "Salt Miser" clamps to tail gate of any dump truck and gives it a complete unit for ice control. The auxiliary gas engine runs at constant idling speed and is cheaper to run continuously than to keep starting and stopping. For full details write to Baughman Manufacturing Co., Jerseyville, Illinois or check the coupon.

Valuable Information
On Aerial Surveys

437. What you should know about aerial surveys is described in detail in the latest literature just released by Alster and Associates, 6135 Kansas Ave., Northeast, Washington 11, D. C. Topographic maps, mosaics and planimetric maps by aerial photograph are fully illustrated. For more information check the handy coupon.

For Prompt Service
Use The Coupon

Warren-Knight
Convertible Level

435. A bulletin which describes a new convertible level, is available from Warren-Knight Co., 136 N. 12th St., Philadephia 7, Penna. This level features a complete new design that offers sturdier construction, longer life and unusual ease of adjustment. For your copy of Bulletin FF, check the coupon.

Self-Propelled
Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Full data on these ditchers available by checking the coupon.

Positioner Relay Kit
Solves Valve Problems

432. Information on a new positioning relay kit for field application to any air-operated control valve is now available from the Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio. Such valve positioning problems as stuffing box friction load, poor response, unbalanced inner valves, hysteresis and undesirable regulating characteristics can be solved by this relay. Get full details by checking the coupon.

Ceramifilter
Two-Piece Filter Block

433. For a full description of a two-piece filter block that completely eliminates hand placement of a filter stone and aeration "bottlenecks," and where the cost in place is no greater than ordinary one-piece filter block floors, get literature from Straitsville Brick Co., New Straitsville, Ohio, or check the handy coupon.

Vibratory Compactor
For Rapid Compaction

436. A four-page bulletin illustrating the many features of the Vibratory Compactor for rapid compaction of single course macadam and gravel sub-bases has been released by Roadequip Manufacturing Co., 30210 Lakeland Blvd., Wickliffe, Ohio. Job applications on various roadbuilding materials are also shown. For full details check the coupon today

Ice Control Without
Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. Check coupon for your copies.

Portable, Standby
Or Continuous Power

440. Generators and power plants for emergency, portable continuous power are described fully in literature available from Katolight Corporation, Box 891-107, Mankato, Minnesota. Information on motor generator sets, high frequency changers and independent generators up to 400 K.W. is included. Check the handy coupon today.

Power Shovel, Crane and
Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co., Winona, Minn. Also, information on front-end loaders and other attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the coupon.

Incinerators for the
Disposal of Combustible Wastes

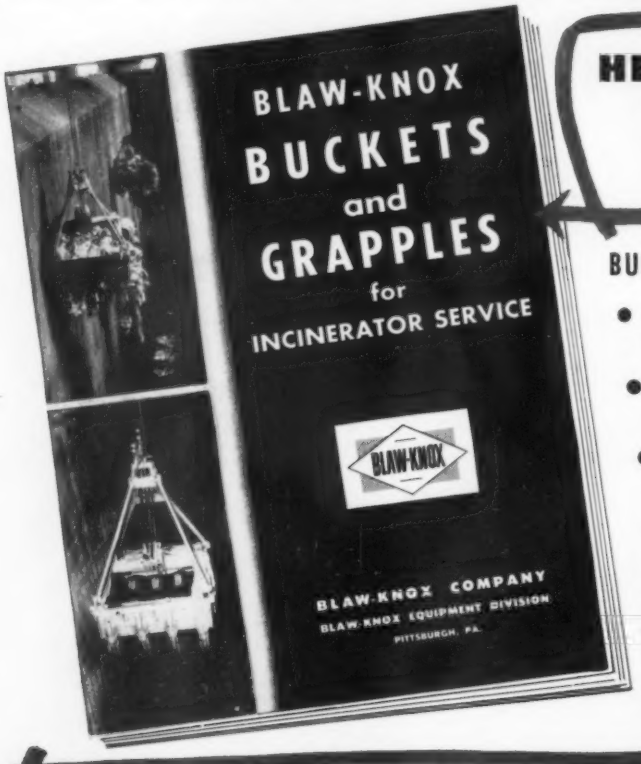
442. Bulletin 179 from the Morse Boulger Destructor Company, New York 17, N. Y. describes fully the basic principles of incineration as to combustion, auxiliary burners, draft and control and elimination of fly ash. Specifications and design of incinerators and hopper doors are included. Check the coupon for your copy.

●

WATER WORKS

A Short Course
In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe joining methods; photos showing jobs where Tylox gaskets met the need for easily assembled, permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the coupon for free copy.



HERE IS THE INFORMATION
every municipal and design engineer needs, when planning a modern incinerator

BULLETIN 2350-R ANSWERS IMPORTANT QUESTIONS

- What clearances (headroom) should you specify for tine type grapples or clamshell type buckets?
- Do you allow *extra* headroom over hoppers for the refuse that hangs below the bottom of the bucket?
- How can you be sure of getting the most economical bucket for your needs?

IT ALSO INCLUDES TYPICAL SPECIFICATIONS

for your guidance in selecting the proper clamshell type bucket or tine type grapple. Write for Bulletin 2350-R today.

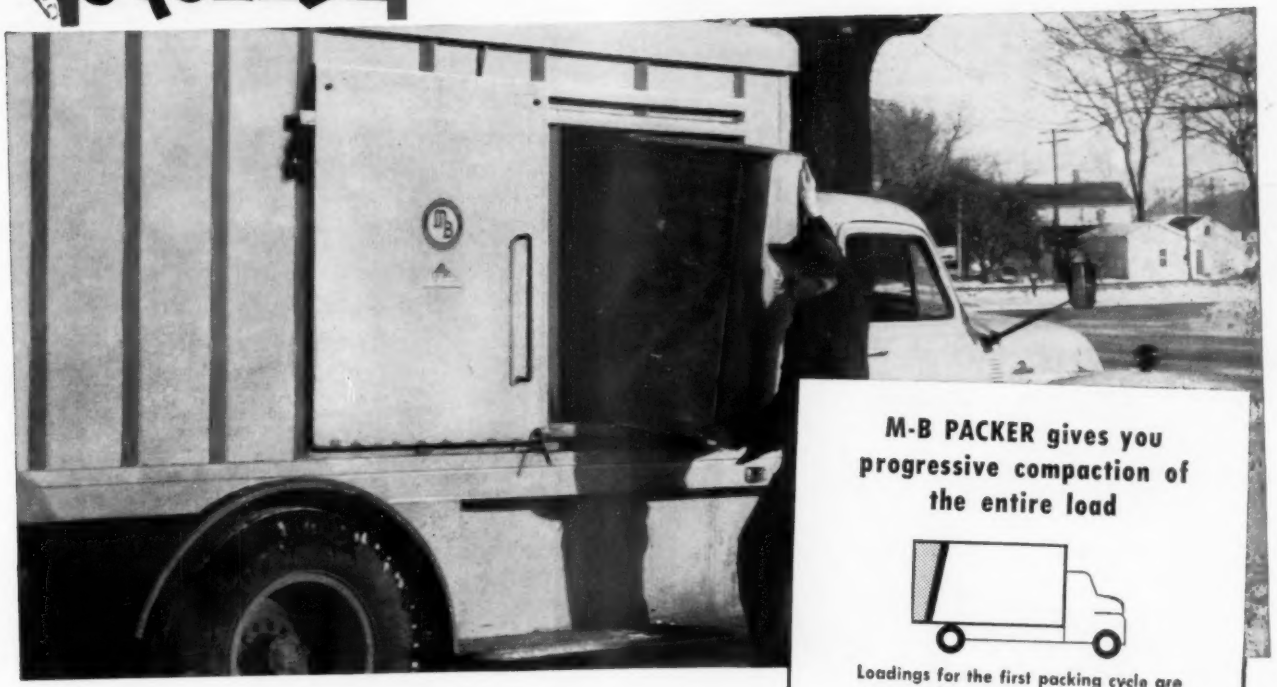
BLAW-KNOX COMPANY
BLAW-KNOX EQUIPMENT DIVISION
Pittsburgh 38, Pa.
Offices in Principal Cities

BLAW-KNOX INCINERATOR BUCKETS AND GRAPPLES

BLAW-KNOX

Get full details of this month's products . . . mail your Readers' Service card today.

M-B PACKER BODY puts the SQUEEZE on garbage collection costs



Thorough, powerful, progressive compaction...M-B compacts more tonnage per cubic yard of capacity

You collect more garbage per trip—cover more blocks per trip—make less trips to the dump per day with an M-B Packer Body. The reason—greater compaction!

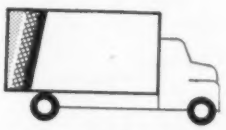
Every yard of refuse that goes into an M-B Packer is *progressively compacted* from the first yard to the last—over and over again with each successive cycle. That's why you can compact more pounds of garbage per cubic yard of capacity with an M-B than with any other unit. Square body means no wasted corners or pockets—and high packing pressure means fewer compaction cycles.

When you're selecting a collection unit—remember—it's the weight you *pack in the body* that pays off! Get all the facts on the M-B Packer Body—write or call M-B Corporation, New Holstein, Wis.

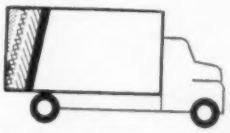
- Costs less to own—to operate—to maintain
- Safest in every phase of operation
- Fastest in every phase of operation
- Versatile—use as truck or van

M-B PACKER gives you progressive compaction of the entire load

Loadings for the first packing cycle are compacted under a force of about 1,000 lbs. per sq. ft.



Loadings for the second cycle are compacted under the same force—and the refuse from cycle 1 gets another thorough compaction in the process.



Loadings for packing cycle 3 are then compacted, during which process, loadings from both cycle 1 and cycle 2 get another thorough compressing from the powerful M-B Plate. This is how M-B's progressive compaction assures complete compaction of the entire load.

PACKER BODIES • LINE MARKERS • SWEEPERS • PAINTS AND BEADS

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Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Comprehensive Bulletin on Swimming Pool Equipment

73. Fully illustrated 12-page Bulletin WC-109 of the Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y., gives complete descriptions of modern filtering and recirculating equipment and accessories for the treatment of swimming pool water. Many indoor and outdoor pools and their equipment are illustrated, and typical flow diagrams show engineering details. For your copy check the coupon today.

Complete Booklet on Pipe Line Equipment

246. Equipment for all types of jointing, maintenance and repair jobs on water, gas and sewer lines is described and illustrated in Catalog No. 25 issued by Joseph G. Pollard Co., New Hyde Park, N. Y. Leak detectors, pipe finders, melting kettles, cleaning tools and a full line of hand tools for water and sewer departments, and many other items are included. Be sure to get your copy now. Just check the coupon.

Manual Covers All Types Of Pipe and Service Repairs

266. Full details on the entire line of Skinner-Seal pipe repair clamps, service fittings and drilling equipment are presented in a new catalog and service manual offered by the M. B. Skinner Co., South Bend, Ind. Step-by-step installation pictures and captions give clear, concise instructions for the repair of all types of pipe leaks. Get helpful Catalog GW by checking the coupon.

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Meters and Instruments For Water Works

43. An attractively arranged 20-page booklet issued by Sparling Meter Co., Box 3277, Los Angeles 54, Calif., furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the coupon for your copy, or write for Bulletin 314.

Dependable Source For All Chlorine Products

66. Get latest data on Jones chlorine service for liquid chlorine, calcium hypochlorite and sodium hypochlorite packaged in lots best suited for your needs. Five strategic locations serve all parts of the country. Check the coupon or write John Wiley Jones Co. Caledonia, N. Y.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

A Clamp That Fits Pipe Regardless of Irregularities

78. A clamp that can be used on either asbestos-cement or cast-iron pipe is described fully in a four-page bulletin just released by the Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. Complete instructions are given as to how the clamp is put on the pipe, along with a price list of the length and size of clamp desired. Just check the coupon.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves are contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., Eliot Street, Fairfield Conn.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Comprehensive Data on Cast Iron B & S Pipe

114. Full specifications, including A.S.A. which give all dimensions of standard and alternate patterns of American Mono-Cast Centrifugal Bell and Spigot Pipe in 3" to 48" furnished by the American Cast Iron Pipe Co., sizes, will be found in a comprehensive booklet Birmingham 2, Ala. Check the coupon for your copy.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5415, Shepard Station, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy

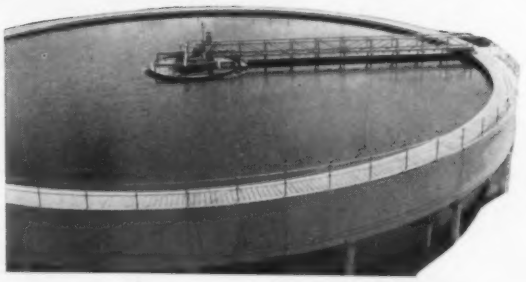
PRELOAD experience

for

ALL

your

tanks



The clarifier tank (above) is but one of many types of prestressed concrete construction offered by PRELOAD. Over 1,000 tanks built are included in our record.

PRELOAD'S years of experience, plus its new policy of centralized engineering and licensing of qualified local contractors, covers the whole range of successful tank construction.

HOW YOU BENEFIT

- Greater efficiency and economy—greater reliability—are due to our licensees' special knowledge of local labor and materials resources. Most of them employ former Preload superintendents.
- Maintenance-free structures.
- Aesthetic virtues (possibilities of architectural treatment) unmatched in any other materials.
- A constant program of improvement in design and construction methods, available to all licensees.

PRELOAD through its own sales engineers or through its licensees is available for consultation. Technical data and literature available on request.

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NEW YORK 16, N. Y.

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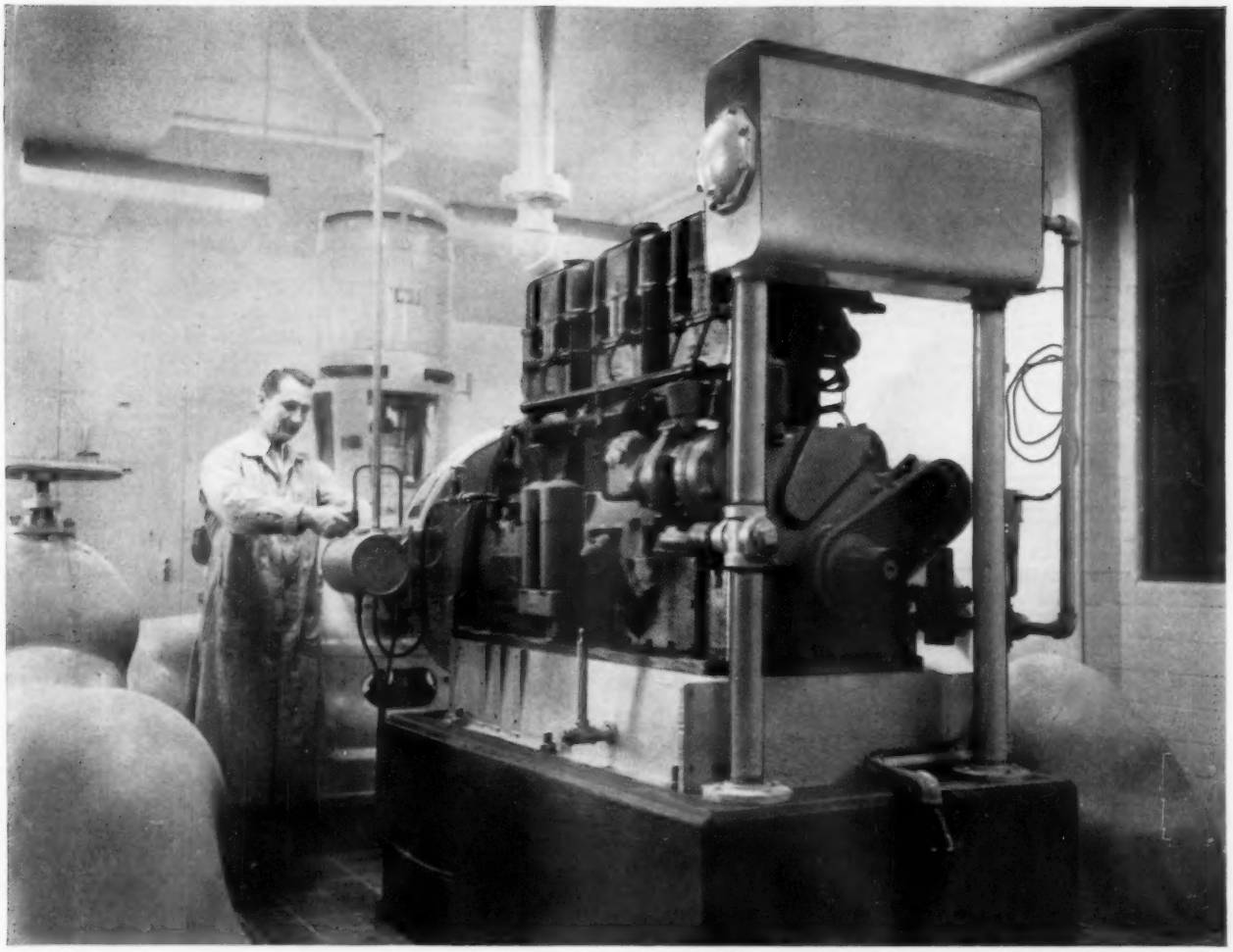

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... the dependability built into Le Roi engines means that you have power when you need it most

The operator of the Le Roi F1500 shown above said, "This engine has surpassed our every requirement for standby power, and has more than paid for itself with dependable, economical, power production when we needed it most."

That's typical of the results experienced by Le Roi engine users everywhere. But you get more than just dependability. You get economy.

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E-108

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

PORTABLE AIR COMPRESSORS TRACTAIR STATIONARY AIR COMPRESSORS AIR TOOLS ENGINES

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Vertical Turbine Pumps For Municipal Water Supply

121. Engineering data on vertical turbine pumps for deep or shallow well operation in capacities ranging from 50 to 10,000 gallons per minute, oil or water lubricated, are covered in a booklet issued by Worthington Corp., Vertical Turbine Division, Succasunna, N. J. Check the coupon today for this helpful information.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2125 Riverdale Ave., Port Chester, N. Y.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the coupon.

Couple Pumps and Where to Use Them

194. Turbine pumps, coupled to motors or gear drives, offer many arrangements to suit your pumping needs. Mechanical features, capacity curves and service applications are reviewed in Bulletin C of Layne & Bowler Pump Co., Box 6991, Los Angeles 22, Calif. Check the coupon for your copy.

What You Should Know About Filter Plant Gauges

156. Helpful data on filter plant gauges and the various types of meters used for filter plant operation are presented in a comprehensive 20-page booklet offered by Simplex Valve and Meter Co., 7 E. Orange St., Lancaster, Pa. A wealth of general information plus specifications and other pertinent data are included. To get your copy of this bulletin, No. 1002, check the coupon.

Engineering Data On Gravity Filter Design

170. The complete line of gravity filters and related accessories furnished by the Permutit Co., New York 36, N. Y., is covered in a well-illustrated 24-page booklet. Each element of a filter and filter controls are discussed in detail to assist the designer of these important units. Get your copy of this helpful publication by checking the coupon.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Precision Line Locator Speeds Maintenance Work

202. Accurate location of buried pipe and cable is made easy with the compact, all-purpose Wilkinson Line Locator, made by Wilkinson Products Co., 3987 Chevy Chase Dr., Pasadena 3, Calif. One-man instrument finds depth as well as location, saves "guesswork" excavations. Get latest data by checking the coupon.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Explaining the Water Diaphragm Principle of Chlorinator Operation

243. The features, operation and benefits of the water diaphragm principle of chlorinator operation are fully described and illustrated in Publication TA-1026-C-1 recently published by Wallace & Tiernan Inc., Belleville 9, N. J. This helpful publication is yours for merely checking the coupon.

Engineering Data on Control Systems For Filtration Plants

270. A 12-page bulletin No. MSA 127 offered by the Hagan Corporation, Pittsburgh 30, Pennsylvania, gives complete details on control and meter components for measuring and controlling such factors as rate of flow, loss of head, filter washing, chemical feeding, settling basin and clearwell level in filtration plants. Diagrams and photographs of control and metering systems are included. Check the coupon for your copy of this valuable bulletin.

Technical Bulletin on Solenoid Operated Valves

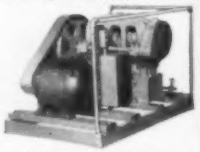
288. Full technical data on application, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2-in. and 2½ to 36-in. sizes. Get all the details; just check the coupon.

Instrumentation and Control Equipment For Water and Sewage Plants

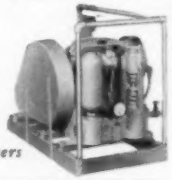
298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

SAVE TIME, MONEY, LABOR WITH THESE STURDY PUMPS

Enclosed unit. All working parts are readily accessible.



Model LC—Delivers 50 gpm at 800 psi.



Model XCVA—Delivers 18 gpm at 600 psi.

● Just turn the high pressure hose on that heavy equipment for a quick clean-up. The solid, hard, driving, high pressure stream from a Hardie Powered Pump Unit will strip off the caked mud, grease, dirt—even that "behind the ears"—in a matter of seconds.

● The Hardie Spray Gun is readily adjustable by a pressure of the fingers from solid stream to a high pressure spray for over-all washing, or a fog like mist for fragile things and fog fire fighting.

● Hardie builds powered pump units in many sizes and models. Enclosed units from 5 gpm at 300 psi to 24 gpm at 400 psi. On casters or skid mounted units up to 60 gpm at 800 psi. Handle all liquids, chemicals, semi-liquid materials. All Hardie pumps are trouble-free, rugged, vertical piston-type pumps that work to their ratings smoothly, quietly, at slow speed.

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DEPENDABLE EQUIPMENT
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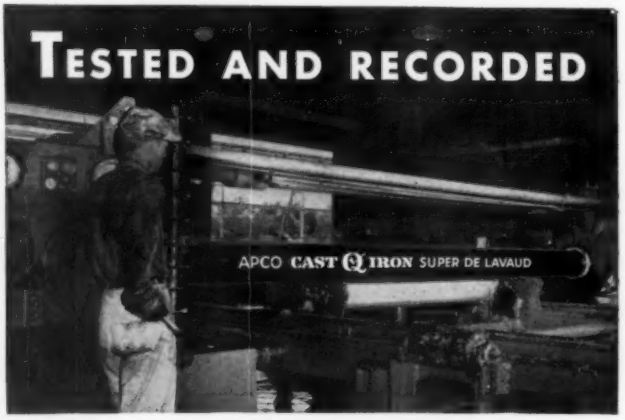

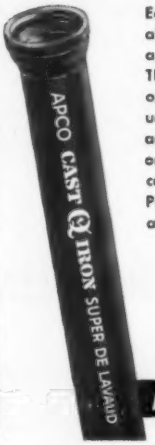

Each length of pipe we manufacture passes through the above hydrostatic test press where it is filled with water and the pressure raised to 500 pounds per square inch. The most common water works pipe is designed for an operating pressure of 150 pounds per square inch. This undergoes the 500 pounds per square inch hydrostatic test and permanent records for each piece of pipe are kept on file for inspection by our customers at all times. You can be assured with Alabama's Super De Lavaud Cast Iron Pipe. In sizes of 3" to 24" in modern long lengths. Bell and Spigot, Mechanical Joint and Flanged Pipe.

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We Invite Inquiries to Our Nearest Sales Office

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350 Fifth Avenue New York 1, New York

ALABAMA PIPE COMPANY
ANNISTON ALABAMA

To order these helpful booklets check the coupon on page 40.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

Portable Sump Pump Needs No Priming

324. The BJ Pneumatic Sponge Pump, a self-contained air-powered unit, is built for heavy duty dewatering use on all construction jobs. Full details on this lightweight portable sump pump are contained in Bulletin No. 543-3-900, available from Byron Jackson Co., Box 2017, Terminal Annex, Los Angeles 54, Calif., or by checking the coupon.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y. Check the coupon for your copy.

Tips for Installing Orangeburg Pipe

336. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Inc., 488 Madison Ave., New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting with other types of pipe are included. Use the coupon for your request.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 140 from Norton Co., Worcester 6, Mass. by checking the coupon.

For Prompt Service Use The Coupon

Have You Heard About Bionetics For Sewage Treatment?

350. Bionetics, a dry staple powder of groups of living organisms preserved with enzyme systems, is available in several types to improve and accelerate the biological processes performed at sewage treatment plants. Get full data from Reliance Chemicals Corp., Box 6724, Houston 5, Texas. Just check the handy coupon.

Concrete in Water Works

360. Helpful data on the extensive use of prestressed and conventional concrete in the construction of water works projects are furnished in a 15-page booklet by the Portland Cement Assn., 33 W. Grand Ave., Chicago 10, Ill. Examples range from dams, pipelines, tanks and buildings to reservoirs and distribution mains. Write to PCA for a copy or check the coupon.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the coupon.

Valuable Information On Prestressed Concrete Tanks

356. This helpful booklet describes the design, uses and advantages of prestressed concrete in all types of storage tanks. Plenty of charts, diagrams and illustrations are included. Get yours from Preload Enterprises, Inc., 211 East 37th St., New York 16, N. Y., or check the coupon.

Engineering Data on Asbestos Cement Pipe

372. Advantages of corrosion-free asbestos-cement pipe for water distribution plus full data on installation methods, cutting, making connections, testing, dimensions and weights are contained in the bulletin, and "Mains Without Maintenance," issued by Keasby & Mattison Co., Ambler, Pa. Get your copies by checking the coupon.

What You Should Know About Meter Setting and Testing Equipment

413. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All water works men concerned with setting and testing meters will want a copy of this catalog, No. 56. Check the coupon for your copy.

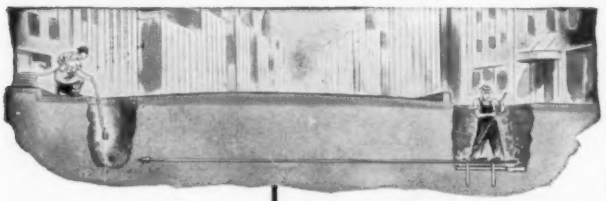
Helpful Engineering Data on Cast Iron Pipe

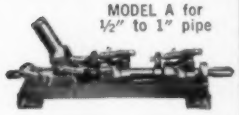
422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long. Check the coupon for your copy.

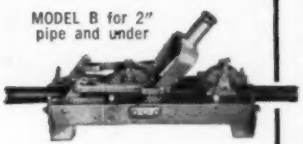
Trojan Pipe Puller & Pusher

installs or renews pipe under pavement

in half the time required by any other machine!







Exclusive continuous action, which eliminates all resetting of grip, does the trick!

The Trojan combines pushing and pulling operations in one machine—keeps pipe continuously moving—lets you install 40' services in as little as 20 min.

Model A needs only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

Model B is reversible in 30 seconds—has 3 speeds for different soils. New dog with individual inserts cuts maintenance.

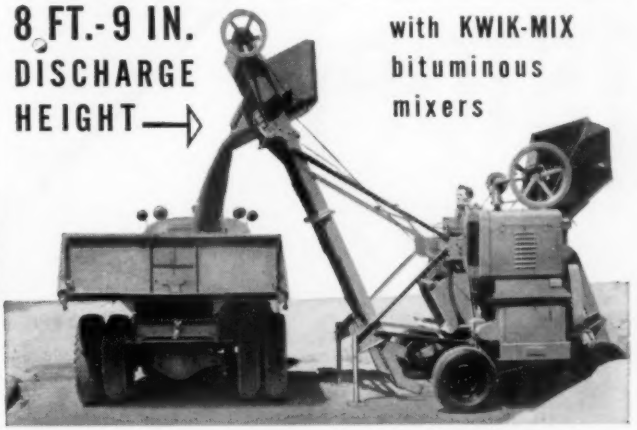
Write today for full details!

The TROJAN Manufacturing Co.

1114 Race Drive • Troy, Ohio

8 FT.-9 IN. DISCHARGE HEIGHT →

with KWIK-MIX bituminous mixers



Now you can load bituminous mix into trucks, overhead hoppers, or stockpile, with Tower Loader attachment on Kwik-Mix Bituminous Mixers. Available on either the 10 or 14 cu. ft. mixers, tower provides 7'-9" to 8'-9" discharge height. Big bucket holds full mixer batch, is raised by power, dumps automatically at top of tower. Bucket travel and discharge are completed while next batch is being mixed. No delay to mixer production. It is single-lever controlled, and powered by mixer engine. Tower is hinged for travel clearance. See Kwik-Mix distributor or write.

Mail to: **KWIK-MIX CO., 3029 W. Concordia, Milwaukee 16, Wis.**
(Koehring Subsidiary)

Send literature on Tower Loader and Bituminous Mixers

NAME .....

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ADDRESS KM387PW

Vandalism cost taxpayers $50,000 a year until Oklahoma switched to signs of Alcoa® Aluminum

Sharpshooters who perforated steel traffic signs used to put a $50,000 hole in Oklahoma's annual highway budget. Then the Oklahoma Highway Department found that while they couldn't stop target practice, they could end the ruinous rust that followed by switching to signs of Alcoa Aluminum.

Because they defy corrosion, even when a rifle slug tears through the message film, Alcoa alloys put a stop to Oklahoma's greatest cause of sign destruction. Weighing only half as much as steel, they made handling and erection easier. And all eight division sign shops reported that the excellent workability of aluminum eliminated tough problems in fabrication.

Oklahoma is only one of 28 states where Alcoa Aluminum cuts sign costs. The advantages they gain can be yours if you call your Alcoa Distributor. He stocks aluminum sign blanks in a variety of shapes and sizes . . . carries aluminum sheet if you shear your own blanks . . . furnishes Alcoa Aluminum Fasteners for trouble-free installations. Finished signs of Alcoa Aluminum are also available from leading traffic sign manufacturers. Aluminum Company of America, 1978-J Alcoa Building, Pittsburgh 19, Pennsylvania.

Your Guide to Aluminum Value

Now's the time to mail this month's Readers' Service card.

Thousands use our Readers' Service card to keep up to date . . . do you?

Cuts digging day to 3 hours with powerful ½-yard Hydro-Trencher

Here the Hydro-Trencher digs a ditch for a new sewer line. Hydraulic stabilizer blade also acts as a backfiller blade. By simply turning the bucket around you can convert the trencher to a swing loader. Hydraulic trip loading bucket is also available.

This Oliver 88WT Hydro-Trencher is working on a city sewer project—locating a manhole 8-feet deep through a 2½ by 5-foot street opening.

By hand this is a full day's work for three men. The Hydro-Trencher cut the time to three hours! Working in cramped quarters is duck soup for the 88WT. Powerful hydraulic down pressure, 170° bucket rotation and maneuverable, dual-circuit control let you dig in the most inaccessible places... work delicately around pipes, foundations without fear of damage.

With the 88WT you can slice through rocky soil, roots, hard Clay—dig all the way to 12 feet. The two complete hydraulic systems on the Hydro-Trencher give you unbelievable control—let you perform any two operations at once without loss of pressure.

Owners of Hydro-Trenchers enthusiastically report savings in time and money on many jobs formerly requiring hand labor or larger equipment. Get the low-down on the most profitable, maneuverable trencher in the field—the Oliver 88WT. See your Oliver Industrial Distributor for a demonstration.

THE OLIVER CORPORATION
400 West Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors

Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 40.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass.

Complete Sanitation and Process Equipment Bulletin

40. A complete illustrated bulletin gives detailed information on all "Rex" sanitation and process equipment. 36 pages of engineering data, process descriptions, conversion factors. Get Bulletin 51-83 by checking the coupon. Chain Belt Co., Box 2022, Milwaukee 1, Wis.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible, Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon

Design Data on Chemical Flocculating Equipment

89. Flash mixers, Straightline mixers, conveyors and elevators for handling chemicals are described in illustrated Bulletin No. 2442 available from Link-Belt Co., Colmar, Pa. Selection tables and diagrams are provided to help you select the equipment best suited to your needs. Check the coupon for your copy.

Proper Installation of Bituminized Fibre Sewer Pipe

105. A well-planned instruction leaflet showing the proper step-by-step procedure for installation of Bermico bituminized fibre sewer pipe has been made available by Brown Co., 150 Causeway St., Boston 14, Mass. To make sure of best results in pipe installation, just check the coupon for your copy.

A Desurger For Use Wherever Liquids Flow

321. Latest bulletin on the Westinghouse desurger has just been released by the Westinghouse Air Brake Company, Industrial Products Division, Wilmerding, Pennsylvania. Sizes and specifications and the operation of the desurger are fully described. A list of offices throughout the country is included. Check the coupon today for the bulletin.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Effective Shredder for Dried Sewage Sludge

45. The rugged and compact Royer Shredder does a quick and effective job of disintegrating sludge cake to produce a good fertilizer for use on city properties or for sale to others. Six sizes, 6 to 150 c. y. per hour, electric, gasoline or power takeoff, stationary or portable are described in Bulletin 55-RS. Write Royer Foundry & Machine Co., Kingston, Pa., or check the coupon for your copy.

Maintenance Painting Systems for Sewage Treatment Plants

56. Recommended maintenance painting systems for sewage treatment plants, based on a detailed study of sewage plant painting problems, practices and experience, have been compiled by The Tropical Paint Co., Cleveland 2, Ohio. Virtually all types of plant equipment are considered in some detail, and information is provided on both new work and repainting. Get this helpful report by checking the coupon.

For Prompt Service Use The Coupon

Reduce Labor Costs With Power Sewer Cleaners

189. A complete line of sewer cleaning equipment, including labor saving power units and all types of buckets, cables, rods and flushing equipment are listed in Catalog 10 of the Turbine Sewer Machine Co., Division of Chas. H. Stehling Co., 1303 N. Fourth St., Milwaukee 12, Wis. Check the coupon for your copy.

Book Offers Help in Using Sewage Plant Gas

223. Means for the maximum utilization of gas generated in sewage plant operation are discussed in 20-page Bulletin C-5200 entitled "Rockwell Products for Sewage Disposal Plants," which is offered by the Meter and Valve Div., Rockwell Mfg. Co., 400 No. Lexington Ave., Pittsburgh 8, Pa. Full data on sewage gas meters, regulators and valves are included in this helpful bulletin. For your copy just check the coupon.

Owners report the new Frink One-Way Taper Blade Sno-Plow used again in last winter's severest storms proved itself to be the most rugged and efficient one-way ever made. Operators particularly praised the throwing and spreading qualities of the Frink because it does not form high side banks that encourage drifting.

The increased taper and moldboard curvature permit higher speeds because of the increased visability and ease of handling.

Frink One-Way Sno-Plows are available in 3 sizes and are interchangeable with the Frink V-Type, Reversible Type, or Roll-Over Type Sno-Plows and the Frink Roto-Broom.

FRINK SNO-PLOWS

For further information on this Sno-Plow write for catalog to Clayton, N. Y., Box PW559

FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK

Made in Canada by

FRINK SNO-PLOWS of CANADA, LTD., TORONTO, ONT.

Water is vital...

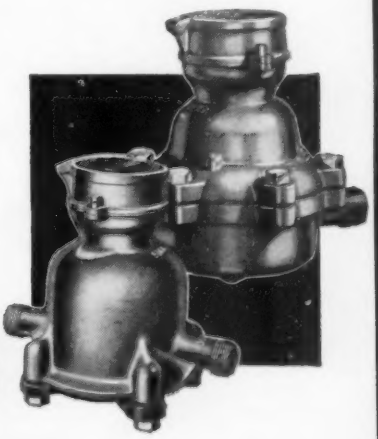
Badger meters conserve it better!

THEY say oil and water do not mix — yet the oil industry uses more than 1600 billion gallons of water annually for refining petroleum. And *nearly 40% of the water used is furnished by public water systems.*

To pinpoint this tremendous volume—more than 4 gallons of water are used in the production of one quart of oil for your automobile.

The Badger water meters used throughout the nation help conserve water for this need . . . just as they do for hundreds of other essential industries and for vital home usage. They measure water accurately . . . provide a precise check on water consumption and waste . . . serving communities by helping make water departments more efficient and self-supporting.

As the experience of waterworks men everywhere shows, Badger meters do the job dependably . . . are a sound investment that pays dividends year after year.



Badger Water Meters

Badger Meter Mfg. Co.
Milwaukee 45, Wisconsin

"Measuring the water of the world for 50 years"

Submersible Sewage Ejector Simplifies Installation

275. The Weil submersible non-clog sewage ejector is a compact unit with a completely sealed motor, available in several sizes with capacities up to 300 gpm. For details on unit selection, installation methods, construction features and controls get Bulletin SE-860A from Weil Pump Co., 1530 No. Fremont St., Chicago 22, Ill. Check the coupon.

Helpful Bulletins Give Sludge Pump Details

318. "Scru-Peller" sludge pumps for handling thick primary sludge, cutting up all solids as they pass through the pump, described with illustrations of details in a 20-page Bulletin 190B. Standard non-clog pumps are described in Bulletins 126E and 127D. Get them from Chicago Pump Co., Dept. J, 622 Diversey Pkwy, Chicago 14, Ill., by checking the coupon.

Engineering Data on Pneumatic Ejectors

327. Advantages of the new shone ejectors with details on receivers, check valves, pilot valve, cover, pipe connections, installation and important operation and maintenance features are fully described in bulletin 4005. Write Yeomans Brothers Company, 1999 North Ruby St., Melrose Park, Illinois, or check coupon for your bulletin.

Corrugated Steel Flooring For New or Existing Structures

373. This 16-page manual contains charts, tables, engineering details and design data, a section on recommended installation practice, and a photographic record of actual bridge plant installations. Write to Products Information Service, Armco Drainage & Metal Products, Inc., Middletown, Ohio, or check the coupon for your copy.

Getting Improved Sludge Dewatering With Non-Clogging Vacuum Filters

425. Latest information on the Komline-Sanderson "Coilfilter", which features non-clogging, permanent filter media to obtain constant output and low operating cost is presented in illustrated Bulletin No. 102 by the Komline-Sanderson Engineering Corp., Peapack, N. J. Be sure to investigate this improved method of sludge dewatering. Check the coupon today.

A Pressure Proven Joint for Concrete Pipe

335. Investigate the Amseal Joint on low pressure concrete pipe for intercepting sewers, inverted syphons, sewage force mains and low pressure water supply lines. This folder is published by American-Marietta Company, Concrete Products Division, 101 East Ontario St., Chicago 11, Illinois. Describes concrete pipe for use in sewer and water lines where maximum operating pressure will not exceed 50 psi. Check the coupon today.

REFUSE COLLECTION AND DISPOSAL

Efficient Landfill Operations For Small Communities

349. Step-by-step photos and concise text are used in a bulletin of the Oliver Corp., to show the construction and operation of a sanitary landfill, using equipment especially suitable for the smaller community, the Oliver OC-3 Tractor-Loader. Besides providing economical refuse disposal, many other jobs handled by this unit are suggested. For a copy, write to the Oliver Corp., 400 W. Madison St., Chicago 6, Ill. or check the coupon.

Check These New Features On Refuse Collection Bodies

383. The all-new Heil "Collectomatic" refuse collection unit incorporates the best features suggested by municipal operating crews, supervisors and private operators to provide easy loading, simple operating mechanism, bulldozer type packing, fast dumping and many other important advantages. Check them all by getting attractive Bulletin BH-54103 from The Heil Co., 3044 W. Montana St., Milwaukee 1, Wis. Your copy is ready—just check the coupon.

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I., N. Y. Check the coupon now to learn how your collection problems can be eased.

Why Cities are Shifting to Pak-Mor Collection Bodies

216. Reduced costs of refuse collection with 12 to 50 yard bodies; faster loading; dense compaction; quicker emptying; sealed doors and simple controls are among the advantages cited in 16-page booklet describing Pak-Mor refuse collection equipment. Get full data from Pak-Mor Mfg. Co., Box 6147, San Antonio, Texas, or check the coupon.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering Inc., Raymond Div., 200 Madison Ave., New York 16, N. Y.

New M-B Packer Body Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16 yd. capacities. Get all the facts from M-B Corporation, New Holstein, Wis. by checking the coupon.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities.

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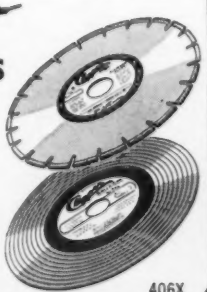

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331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 8, Wis. Get your copy by checking the coupon; you'll find this booklet both interesting and valuable.

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STREET LIGHTING AND TRAFFIC CONTROL

Modern Lighting for Sports Events

133. Helpful engineering data on standardized "Sportslighting" are provided in a comprehensive 56-page manual issued by Westinghouse Electric Corp., Lighting Div., Cleveland, Ohio. Floodlight layouts and floodlighting equipment are shown for baseball, football and softball fields, tennis courts, golf driving ranges and many other outdoor and indoor sports activities. Application suggestions show how lights may be mounted and wired for best results. Get this authoritative booklet, No. B-5872, by checking the coupon.

Helpful Data on Street Lighting Equipment

193. Complete data on Monotube street lighting lighting standards together with information on brackets, mast arms and accessory attachments is available from Union Metal Mfg. Co., Canton 5, Ohio. Be sure you have the latest data on street and highway lighting equipment. Check the coupon now.

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What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the coupon today.

Safety Lantern With Pencil Beam Signal

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Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the coupon today.

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Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Comprehensive Data on Bulldozers

232. Hydraulic Bullgrader and bulldozer blades for International crawler tractors are described in a 24-page catalog published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. All features are fully described, complete specifications are included and many illustrations show on-the-job operations. Check the coupon for your copy.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

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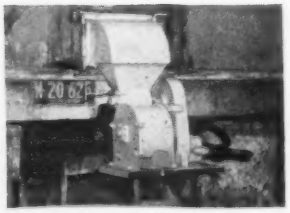

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A Tractor-Air Compressor Unit

140. "Around the Clock, Around the World" is the title of an 8-page bulletin describing Le Roi's new 125 Tractair, a self-propelled compressor unit with flexible tractor power. Applications, uses, attachments and tools, design and specifications of the compressor and engine are listed. Write Le Roi Division of Westinghouse Air Brake Company, 1706 South 68, Milwaukee 14, Wisconsin, or check the coupon for your copy.

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234. Insto-Gas torches and furnaces give trouble-free service for lead melting, soldering and all other jobs where a steady, clean, hot flame is needed. Convenient cylinders require no regulating gauges and attach directly to standard furnace assembly. Full details from Insto-Gas Corp., 1977 E. Woodbridge St., Detroit 7, Mich. by checking the coupon.

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Faster Cuts in Concrete Pavement

317. Clean, fast cuts in green or cured concrete and asphalt pavements are easily made with the powerful Champion concrete saw. Perfect balance and "either-side" blade arrangement helps speed the work when sawing joints and cutting outlines for patches. Get full details from Champion Mfg. Co., 2028 Washington Ave., St. Louis 3, Mo. Just check the coupon.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal; and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tourneau-Westinghouse Co., Peoria, Ill., or check the coupon.

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What You Should Know About Soil Sampling

255. Acker Soil Sampling Catalog No. 25 contains a complete and thorough collection of information about soil sampling in all types of sub-surface conditions. Modern sampling techniques are discussed together with recommendations as to tools and accessories. Write Acker Drill Co., Inc., Scranton, Pa., or check the coupon.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Cut Road Building Costs With A Tamping-Leveling-Finisher

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289. An illustrated folder describing the Bros line of road machinery is available from Wm. Bros Boiler & Manufacturing Co., Minneapolis 14, Minn. Full descriptions of Bituminizer distributors, Spraymatic spray bars, several types of compacting equipment and other units are included. Check the coupon.

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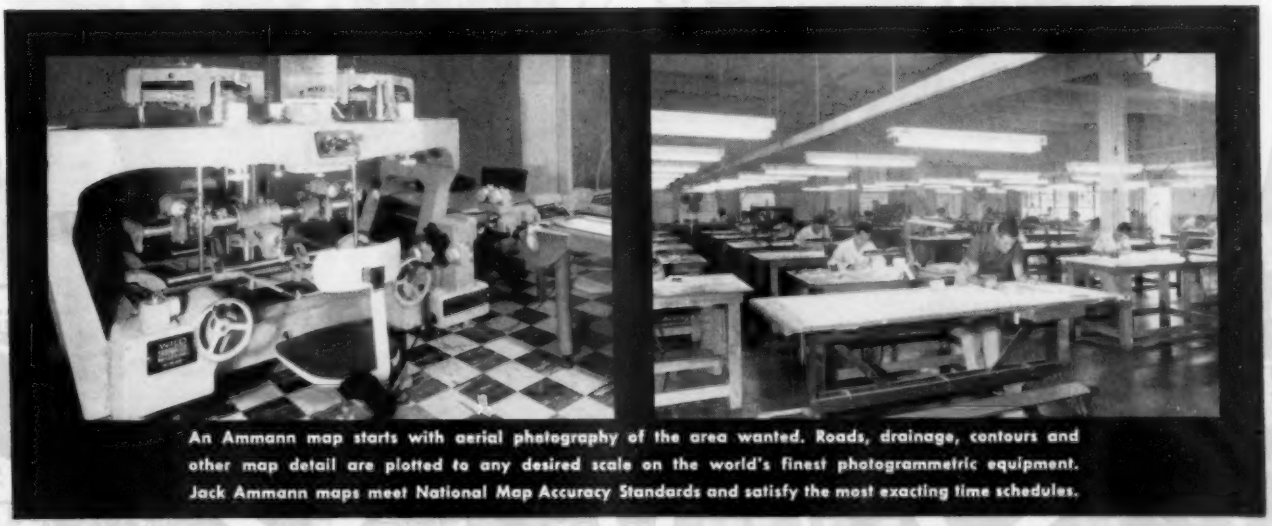

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Latest Data on Prestressed Concrete Lighting Standards

265. Comprehensive data on prestressed concrete standards for street and highway lighting is contained in a 24-page catalog which contains complete engineering tables and descriptive information on design features, mounting arrangements, base type choices and specifications of Hy-Lite standards. Get helpful and easy-to-read Catalog No. 300 by writing to American Concrete Corp., 5092 No. Kimberly Ave., Chicago 30, Ill., or check the coupon.

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277. Fitchburg Chippers, engineered to solve the brush disposal problem, reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16-page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the coupon for your copy

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Better Paving On Small Jobs

176. Blaw-Knox Company's small-job paving machine, the Adnun Jr. 8, is the subject of a new bulletin, No. 2609. The Adnun Jr. is equipped with a 12-HP motor. Hopper capacity is approximately 2 tons. It will pave an 8-ft. strip. For full engineering details and on-the-job performance data, get this bulletin from Construction Equipment Div., Blaw-Knox Co., Pittsburgh 38, Pa. Check the coupon.

The Dilemma of Our Present Highway System

314. "Where Do We Go From Here?" is the title of the new 16-page booklet produced by Caterpillar Tractor Company, Peoria, Illinois. Many highway problems are discussed in the interesting and informative booklet. Inadequate and obsolete highways, financing of free roads and toll roads, and whether to construct free roads or toll roads are a few of the topics. A section is devoted entirely on the story of modern highways from the planning stages through the construction stages to the finished roadways. Check the coupon for this booklet.

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Galion 503 Tandem Drive Economy Grader

145. A sixteen-page catalog #380 has just been released by The Galion Iron Works & Mfg. Company, Galion, Ohio, describing the numerous construction and operating features of the Galion Model 503 Motor Grader. Optional equipment includes hydraulic shiftable moldboard, front-end scarifier, "V" and straight snow plows, rear-end bucket loader and bulldozer. Check the coupon.

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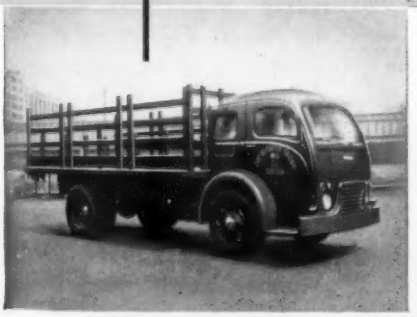

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1. **BJ supplies a *complete* line of centrifugal pumps and mechanical seals.**
2. **BJ can job-engineer any special pump to the required capacity, head, pressure and power.**
3. **BJ has competent sales engineers in 36 cities throughout the country.**
4. **BJ backs you by parts and service facilities of a long-established nation-wide organization (since 1872).**

BJ SUBMERSIBLE BOOSTER PUMPS

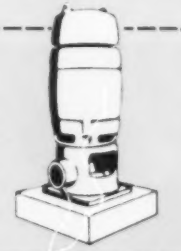
Complete pumping stations can be placed underground, under streets, parks, etc. Eliminate real estate investment and economically boost pressure for sub-division expansion, etc.

Write for BJ Bulletin No. 55-2-700

BJ DEEPWELL TURBINE PUMPS

Bowl and impeller assemblies to meet every deepwell need. Standard models for wells 6″, 8″, to 24″ dia., capacities to 9000 gpm, heads to 600 ft. "Bee Jay" models for 4″, 5″ and 6″ dia. Choice of water or oil-lubrication.

Send for BJ Bulletin No. 54-1-10,000



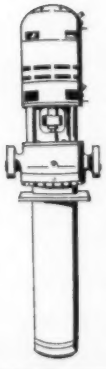
BJ LAKE AND RIVER INTAKE PUMPS

These pumps eliminate high or low water and icing problems on lake and river intake installations. Capacities to 20,000 gpm. Water-jacketed to operate in or out of water.

BJ BILTON PUMPS

General purpose pump with close-coupled motor pump unit. Mounts in any position. No rigid foundation needed. Ideal for portable service. Capacities to 2000 gpm, heads to 600 ft. Wide range of sizes.

Write for BJ Bulletin No. 353-1000



BJ HYDROPRESS PUMPS

Double-case pumps suitable for hydraulic press, boiler feed and descaling operations, other high-pressure, low-capacity water pumping requirements. Capacities to 500 gpm. Heads to 7000 ft.

Write for BJ Bulletin No. 52-6400

BJ VERTICAL PROPELLER PUMPS

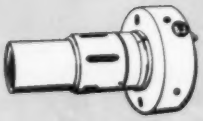
Single-stage pumps. For medium to high capacity jobs with low heads. Capacities to 50,000 gpm. Heads to 40 ft. For drainage, river-intake, dewatering, irrigation, etc. Easily adapted to special needs.

Write for BJ Bulletin No. 53-5800

BJ VERTICAL CIRCULATING PUMPS

Single or multi-stage. For pumping medium to high capacities of water. Two size ranges. Capacities to 50,000 gpm. Heads to 40 feet. Saves space, simplifies piping. For cooling tower, dewatering, drainage, river-intake and circulating.

Send for BJ Bulletin No. 52-6050



BJ MECHANICAL SEALS

High precision seals which replace standard packing in stuffingboxes. Types to fit all centrifugal pumps. Available for handling different pressures, temperatures and liquids.

Send for BJ Bulletin No. 54-1-10,000

BJ SINCE 1872

Byron Jackson Co.

PUMP DIVISION

P.O. BOX 2017, TERMINAL ANNEX
LOS ANGELES 54, CALIFORNIA

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It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

MODERN HY-LITE LIGHTING STANDARDS help brighten Historic New Orleans

DAYTIME BEAUTY
HY-LITE granite finish standards add beauty to any area.

NIGHTTIME SAFETY
is assured with modern standards and luminaires.

South Claiborne Avenue—Part of 14 miles of modern street lighting completed to date using American Concrete Hy-Lite standards for mounting fluorescent mercury vapor luminaires.

FOR:

- **BEAUTY**—smooth polished granite finish with trim graceful lines.
- **ECONOMY**—numerous cities will attest to no maintenance for 20 and more years.
- **DURABILITY**—pre-stressed and spun for maximum strength. Impervious to all the elements.

You can't beat American Concrete HY-LITE lighting standards.

Complete information on designs and dimensions is contained in our Catalog #300, which is available upon request. Write today to American Concrete Corporation, 5092 North Kimberly Avenue, Chicago 30, Illinois.

American Concrete
PRESTRESSED CONCRETE LIGHTING STANDARDS

Thousands use our Readers' Service card to keep up to date . . . do you?

Thousands use our Readers' Service card to keep up to date . . . do you?

GO MODERN UNDERGROUND, TOO!

Builders, plumbers, architects, engineers use and recommend Orangeburg Root-Proof Pipe because they know it meets modern construction methods . . . and its quality is unsurpassed.

Orangeburg Roof-Proof Pipe is accepted by approving authorities in leading cities and towns across the nation for house sewers, septic tank connections and other underground non-pressure uses. Installations made 49 years ago are still going strong. Nearly 200,000,000 feet are giving dependable service today from Maine to California. That's because the tough, strong material lasts for years and because the watertight joints keep out roots. Orangeburg sewer lines are rugged, durable, long lasting.

Lightweight 8-foot lengths are easy to handle and install. Joints seal root-proof with a few light hammer taps. No cement or compounds are needed. Installations are quick, easy and economical. Made in 2″, 3″, 4″, 5″ and 6″ sizes.

Orangeburg also comes *perforated* for septic tank disposal fields, foundation drains . . . draining wet spots in lawns and fields.

ORANGEBURG®
ROOT-PROOF PIPE

ORANGEBURG MANUFACTURING CO., INC. • Orangeburg, N.Y. • West Coast Plant, Newark, Calif.

ORANGEBURG ROOT-PROOF FITTINGS

¼ BEND | WYE | ⅛ BEND | NEW TEE Now Ready

Orangeburg Fittings are precision made of famous Orangeburg materials and include a complete line of ¼ bends, ⅛ bends, Wyes and Tees. Each fitting has the exclusive Taperweld Joint for making fast, root-proof joints.

SEND FOR ALL THE FACTS

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N.Y.
DEPT. PW-95

Please send us Report "A" on Orangeburg's outstanding qualities for house sewers and septic tank connections, by a preminent sanitary engineer.

Name .....

Address .....

City ..... State .....

Now's the time to mail this month's Readers' Service card.

Thousands use our Readers' Service card to keep up to date . . . do you?

16 MILLION GALLONS OF WATER PER DAY, *even in extremely dry periods*

Says

Mr. R. E. Cannard
Manager, City of Manitowoc
Public Utilities

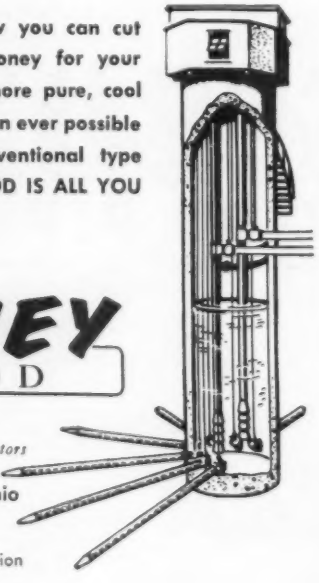
the RANNEY METHOD a **"MUST"** for the
CITY OF MANITOWOC, WISCONSIN

Collector "A" at the Power Plant, City of Manitowoc

Mr. Cannard says, "We have found the RANNEY to be far more efficient than the conventional type wells. Our RANNEY collectors require less personnel, fewer pumps, cuts operating costs, and eliminates filter stations altogether. The RANNEY METHOD has solved our water problems and the collectors are just as good today as they were when they were installed ten years ago."

FOR YOUR CITY TOO

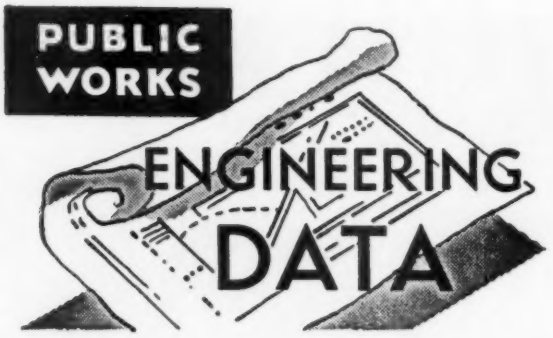
Write now, and learn how you can cut unnecessary costs, save money for your community, and produce more pure, cool water from just one well than ever possible before, with multiple conventional type wells. THE RANNEY METHOD IS ALL YOU NEED.



RANNEY METHOD

Water Supplies, Inc.
Water Supply Engineers and Contractors
841 Alton, Columbus 19, Ohio
Dept. PW-1

Associate:
Ranney Method Western Corporation



Machine vs Hand Pavement Resurfacing Costs

Costs for machine and hand resurfacing are given in the report of the Dep't. of Public Works for the City and County of San Francisco. Including all indirect and overhead charges, machine resurfacing cost 5.54 cents per square foot while hand resurfacing cost 11.42 cents.

Catch Basins Cost $6.75 to Clean

During the past fiscal year 15,059 catch basins were cleaned in San Francisco, Calif., using eight eductors, at an average cost of $6.75 per basin. The average time to clean a basin was 38 minutes which included travel time. The city has 25,000 such catch basins.

Cost of Repairing, Testing and Installing Meters

The cost of repairing meters damaged by frost in Detroit, Mich., was $4.53 for ⅝-inch, of which $2.93 was for labor and $1.60 for materials. For ¾-inch meters, the costs were $3.16 for labor, $2.09 for materials and $5.25 total. For 1-inch meters, overall cost was $6.96 each. For repairing meters damaged by hot water, average costs were $5.81 for ⅝-in., $7.13 for ¾-in., $9.07 for 1-in. and $23.57 for 1½-in.

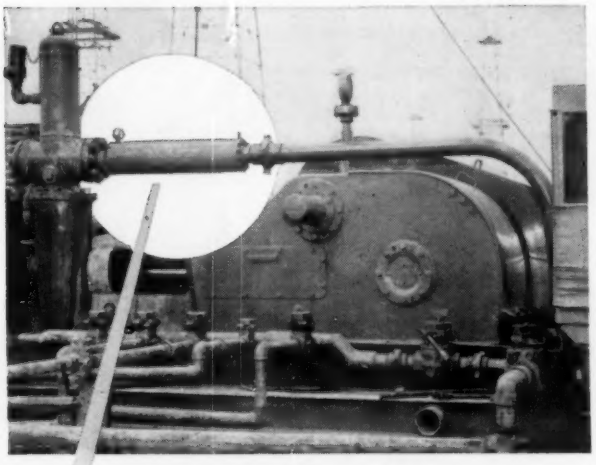
Cost of testing meters ranged from 17.4 cents for ⅝-in., through 23 cents for ¾-in., 37 cents for 1-in. and $1.71 for 2-inch to $15.45 for 8-in.

Average cost of installing a ⅝-in. meter was $19.95; for a ¾-in. meter $29.44 and for a 1-inch meter $43.56. In comparison, a 6-in. compound meter cost $1215.59.

All of these data are from the annual report for the year ending June 30, 1954.

Rehabilitating Old Cement-Concrete Pavements

Older cement-concrete pavements in Wayne County, Mich., are rehabilitated by resurfacing them, after preparation by cleaning and priming, with asphaltic concrete. This is laid in two courses, binder and wearing, each one inch thick. This provides a very smooth surface. In addition to force account work, seven contracts for such resurfacing were awarded in 1954; in all 395,000 sq. yds., equivalent to 34 miles of 2-lane road, were resurfaced. The work included widening and resurfacing a section of Seven Mile Road. Originally laid in 1917, and twice widened, the 48-ft. pavement was widened this time to 64 ft. by laying 8-ft. strips on either side, with a 9-in. concrete base and asphaltic concrete surface. Where the existing edges were ragged or varied from true grade, a straight edge was obtained by using a concrete saw. This added greatly to the appearance of the finished pavement.



SURGE-FREE OPERATION-

wherever liquids flow

through **Westinghouse**

IN-LINE

Desurgers

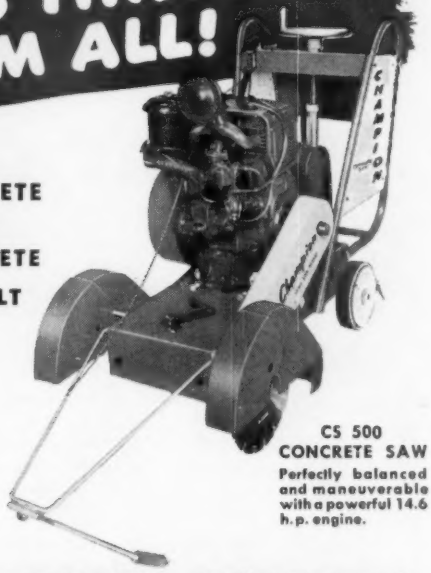
Westinghouse In-Line Desurgers protect pipe systems from 1½" to 18" in diameter operating at pressures up to 2,000 psi.

The new Westinghouse In-Line Desurger, in tests under actual operating conditions, removed 92% of the surge pressure build up in liquid carrying pipelines. By preventing violent pressure surges, they protect pumps, valves, fittings and instruments from damage . . . they increase flow capacity . . . they reduce maintenance costs. Write for descriptive leaflet A6-118.01.

Westinghouse Air Brake
COMPANY
Industrial Products Division
WILMERDING PENNSYLVANIA

ZIPS THROUGH THEM ALL!

- GREEN CONCRETE
- CURED CONCRETE
- ASPHALT



CS 500 CONCRETE SAW
Perfectly balanced and maneuverable with a powerful 14.6 h.p. engine.

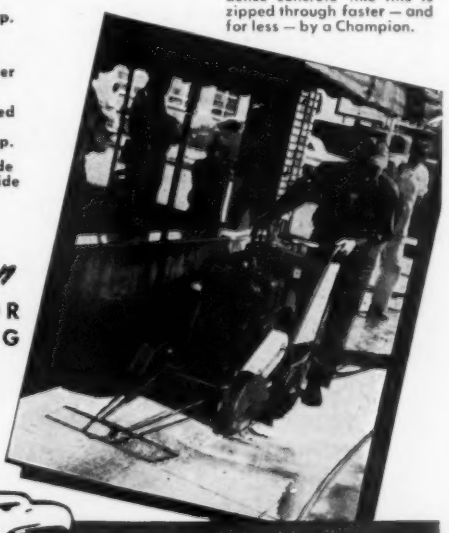
EASIER-FASTER-CHEAPER!

Champion

CONCRETE SAWS

This rugged, yet compact Champion harnesses 14.6 horses to get clean, straight bites in asphalt, green and cured concrete. Champion's compact and perfectly balanced design produces speedy cuts, saves important on-the-job time and labor costs, maneuvers easily in confined areas...cuts right into closest corners with Champion's "either-side" blade arrangement. Ask your distributor about the Champion or write direct. Champion's labor and money-saving features are worth checking into!

- Powerful 14.6 h. p. Gasoline Engine.
- Non-Sway Ball-Bearing Solid Rubber Wheels.
- Positive Screw Feed with Adjustable Positive Depth Stop.
- Dual Purpose Blade Guard for Either-Side Cutting.



Sidewalk Patching with a Champion. Even well-cured, dense concrete like this is zipped through faster — and for less — by a Champion.

BUY *Champion* BLADES FOR ALL CUTTING

Champion MFG. CO.
2028 WASHINGTON AVE., ST. LOUIS 3, MO., U.S.A.

PAK-MORS ENGINEERED TO CUT COSTS

conventional pak-mors

Serving hundreds of cost conscious cities from coast to coast. Conventional, truck mounted 13-16-20-24 cu. yd. PAK-MOR refuse collection bodies set the pace for economy and efficiency. Whether your needs are large or small—there's a PAK-MOR built to serve them all.

specialized pak-mors

The 32 cubic yard PAK-MOR trailer leads the economy trend for efficient refuse handling. Adaptable to most collection systems, it also offers A NEW APPROACH to heavy collections in concentrated areas. Readily modified to meet your specialized NEEDS. Our engineers will work with you to solve your problems!

custom built pak-mors

Present the modern and progressive solution to transfer and Long Haul problems. Conventional PAK-MORS will unload into this 38 cu. yd. trailer, thus drastically reducing Long Haul costs. Another PAK-MOR pace-setter to help you overcome increasing costs through practical design and engineering.

★ CONSULT OUR ENGINEERS ON YOUR COLLECTION PROBLEMS

PAK-MOR MANUFACTURING CO.

LOOP 13 & ROOSEVELT ★ P. O. BOX 6147 ★ SAN ANTONIO, TEXAS

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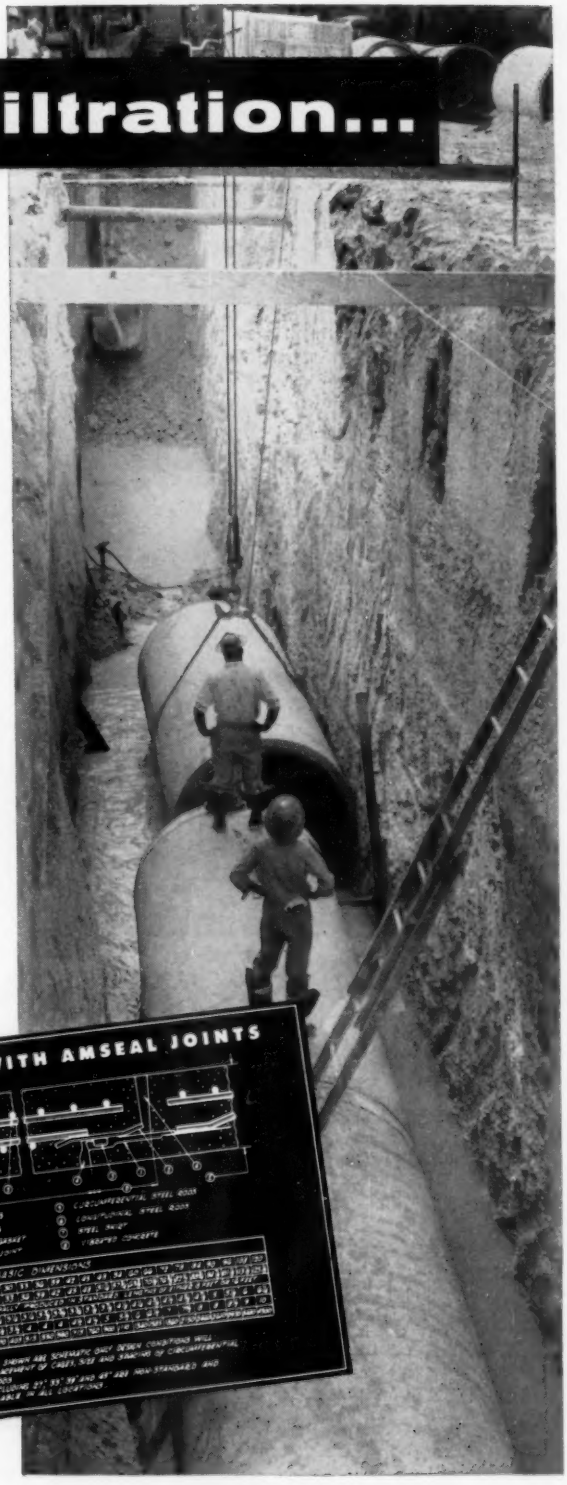
STOP costly infiltration...



specify

AMSEAL JOINTS

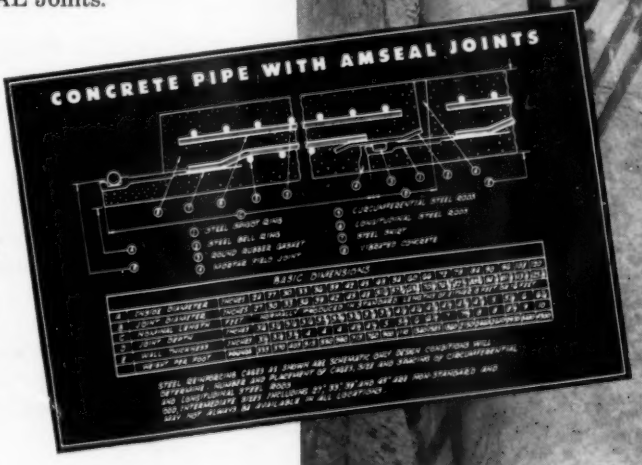
Contractors appreciate the simplicity and economy of installing precast concrete pipe furnished with foolproof AMSEAL Joints—particularly where trench conditions are wet and troublesome. The continuous, round rubber gasket assures a watertight seal against infiltration or leakage. AMSEAL Joints provide the necessary flexibility to permit normal expansion, contraction, deflection and settlement without reducing their effectiveness.

The efficiency and long life of AMSEAL Joints results in *greater economy*—through savings in the construction, operation and maintenance of sewage pumping and treatment facilities. With pipe lengths of 16 feet, there is less joining—less time on the job. Inside surfaces are smooth for maximum capacity.

Write today for specifications on precast concrete pipe with trouble-free AMSEAL Joints.

This "pressure proven joint" is furnished on low pressure concrete pipe for:

- INVERTED SIPHONS
- WATER INTAKE LINES
- INTERCEPTING SEWERS
- OUTFALL SEWER LINES
- SEWAGE FORCE MAINS
- LOW PRESSURE WATER SUPPLY LINES



AMERICAN-MARIETTA COMPANY
CONCRETE PRODUCTS DIVISION

GENERAL OFFICES

AMERICAN-MARIETTA BUILDING, 101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS PHONE: WHITEHALL 4-5600

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eliminate destructive foreign matter in your influent...

JEFFREY traveling water screens remove floating debris and suspended matter from raw water.

An endless chain of traveling screen panels, moving upward on the entrance side, carries refuse to surface. High pressure water spray washes screen deposits into carry-away trough.

USE—in all plants requiring large volumes of water.

EASY INSTALLATION—Compact unit consists of vertical traveling screen, screen baskets, chain, sprays, guides, drive unit, frame, and semi-enclosed housing.

OPERATING ECONOMY—Enclosed ball bearing motor, anti-friction bearing speed reducer with gears running in oil, non-clog spray pipes with quick-opening valves.

STURDY CONSTRUCTION—Welded steel baskets, steel thimble roller chain, cast iron chilled rollers, cold roll steel head and foot shafts, fine mesh wire screen, ⅜-inch structural steel frame.

COMPLETE PROTECTION—End skirts form seal as baskets pass through boot. Adjacent basket cross members overlap to seal basket joint. End skirt flanges cover chain. Speed reducer has overloaded protection.

Jeffrey's broad experience in design and construction covers all types of sanitation system installations. Hundreds of municipal plants and private industrial plants over the entire nation are Jeffrey-equipped. The Jeffrey line includes:

Bar and Disc Type Screens	FLOCTROLS
Screenings Grinders	Dry Feed Chemical Machines
Grit Collectors & Washers	Biofiltration Plant Equipment
Sludge Collectors	Garbage Grinders
Sludge Elevators	Belt and Spiral Conveyors
Scum Removers	Bucket Elevators
Power Transmission Machinery	Chains and Sprockets

Traveling Water Screens

Write Sanitation Sales Division. The Jeffrey Manufacturing Co., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Now's the time to mail this month's Readers' Service card.

Thousands use our Readers' Service card to keep up to date . . . do you?

They choose TYLOX *Flexible* PIPE JOINTS

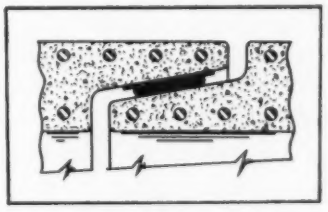
to assure

LEAK-PROOF, CORROSION-RESISTANT PIPE LINES

Thousands of Dublin citizens view this TYLOX-Jointed concrete pipe as it passes in review during a St. Patrick's Day Industrial Parade. Manufactured by Moracrete, Ltd., of Dublin, it is part of 53,000 feet of similar pipe required for the $6,000,000 North Dublin Drainage Scheme.

In designing the system, engineers knew that no ordinary pipe joint could last for long under the tough conditions involved. Its location along the coast meant the line would be subject to severe VIBRATION, SHEAR stress and CORROSION. In fact, there was only *one* pipe joint the engineers felt safe in specifying . . . TYLOX Rubber Joints.

TYLOX-Jointed pipe lines are giving trouble-free service under "tough" conditions, all over the world. That's why more and more waste disposal authorities are specifying "TYLOX" for their projects. Like the Dublin officials, they want to make sure their pipe joints are safe from failure, *whatever* the conditions.



Non-corrodable TYLOX Joints seal water-tight by compression, and outlast the pipe itself.

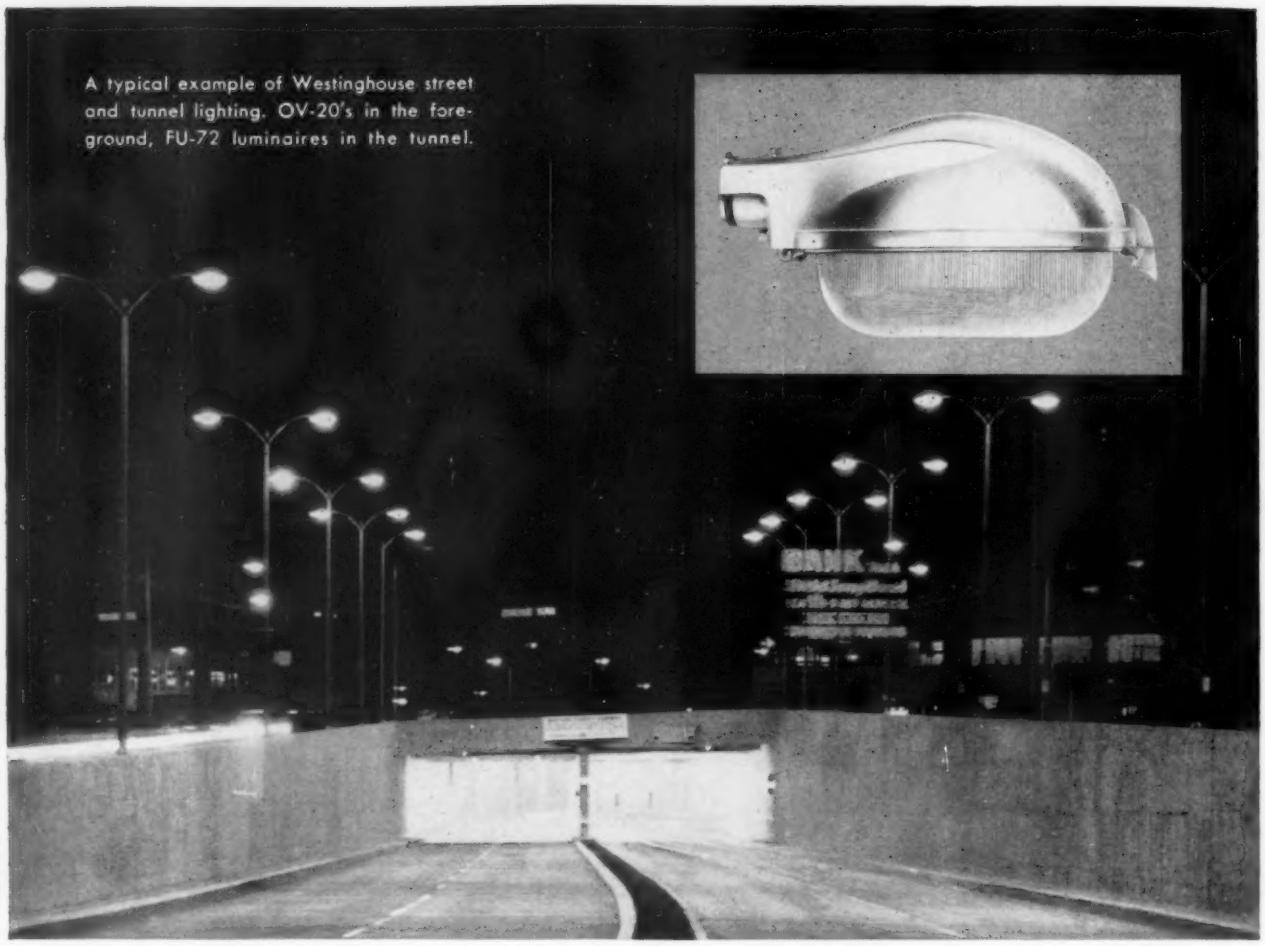
5010

WRITE FOR our new 20-page booklet "Joint Enterprise." Read the facts on TYLOX — and the case histories supporting the facts — and specify TYLOX Rubber Joints on your next pipe job.

HAMILTON KENT
MANUFACTURING COMPANY
KENT, OHIO
427 West Grant St. Orchard 3-9555

Get full details of this month's products . . . mail your Readers' Service card today.

Now's the time to mail this month's Readers' Service card.



A typical example of Westinghouse street and tunnel lighting. OV-20's in the foreground, FU-72 luminaires in the tunnel.

Why Seattle specified Westinghouse OV-20 luminaires on their new freeway

Problem: Select a street light that would give Seattle drivers the best possible night visibility on the new Alaskan Freeway and smooth good looks by day. A point-by-point analysis showed Westinghouse OV-20 mercury luminaires to have these qualifications as well as the following superior mechanical construction and maintenance features.

One-piece cast aluminum housing—adds rigidity and weather resistance to the OV-20.

New optical system—New reflector and refractor design improves distribution of light along the street.

Weatherproof seal—between the housing and glassware, holds cleaning to a minimum.

One-hand maintenance—Cleaning, washing and relamping can be done without tools, and without exposing the wiring or damaging the stationary reflector. Open-type latch makes it impossible to drop glassware while cleaning.

Smooth good looks—Mounted on either concrete or metal poles, the modern unbroken design of Westinghouse mercury luminaires adds a progressive appearance to large communities and small.

And the Westinghouse OV-60, second member of the mercury family, gives wide streets better visibility and greater uniformity of pavement brightness—with all the plus features of the OV-20.

Be sure you specify Westinghouse OV-20 mercury luminaires—the original mercury street light—copied in general appearance but never duplicated in performance. More information? See your nearby Westinghouse representative. J-04380

YOU CAN BE SURE... IF IT'S Westinghouse

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Get full details of this month's products . . . mail your Readers' Service card today.

Behind control building, PFT Floating Cover on 35' digester

At Sykesville, Maryland . . .

A hospital equips for effective sludge digestion

WITH MODERN PFT EQUIPMENT

To meet its own rigid sanitary standards, the Springfield State Hospital at Sykesville, Md. constructed a filter-type sewage treatment plant in 1953. Key features of the plant are the items of PFT equipment installed for effective sludge digestion!

In the 35' digester, a *PFT Floating Cover* was specified for its positive scum submergence and safe utilization of gas. Floating Covers reduce explosion hazards by maintaining gas at positive pressure to prevent the entrance of atmospheric oxygen.

Floating Covers also simplify operations by eliminating the need for fixed levels—additions and withdrawals can be made at times best suited to the overall operation.

In the control room, a *PFT Cover Position Indicator* (Liquidometer) tells the operator at a glance the exact position of the Floating Cover.

The hospital was naturally concerned over the possibility of odor nuisance. To avoid this problem, a *PFT 2" Waste Gas Burner* was installed to burn off safely all excess gas produced in the digester.

As in all its installations, PFT assisted consulting engineers by showing the adaptability of its equipment in meeting specific plant requirements. To further assure successful treatment, PFT instructed plant personnel in the proper operation of its equipment.

Design of plant by / *Whitman, Requardt & Associates, Baltimore, Maryland*

waste treatment equipment exclusively since 1893

P.F.T.

PACIFIC FLUSH TANK CO.
4241 Ravenswood Avenue
Chicago 13, Illinois

PORT CHESTER, N. Y. • SAN MATEO, CALIF. • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

Need more facts about advertised products? Mail your Readers' Service card now

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

MINNEAPOLIS CHOOSES MONOTUBE POLES

for world's longest uninterrupted stretch of fluorescent street lighting.

On modernized Lake Street, as shown above, approximately 500 plain round Monotube lighting poles effectively mount 21,000 lumen fluorescent fixtures at 30 ft. 5 in. These increasingly popular units provide 30 times more illumination than the ornamental type lights they replaced.

If you are considering new lighting or relighting, get complete information on attractive, economical Monotube poles. Write to The Union Metal Manufacturing Company, Canton 5, Ohio, for catalogs on either steel or aluminum Monotubes.

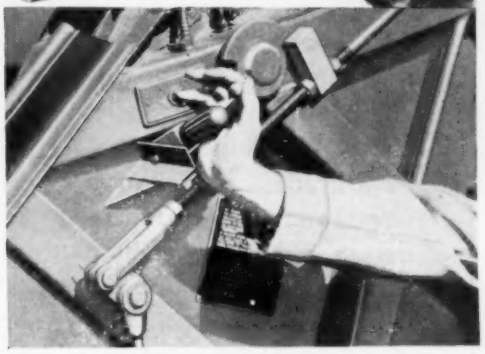
UNION METAL

Monotube Lighting Poles

SAFETY PLUS
LOAD-PACKER's "Safte-Matic" control is located away from moving parts. Gravity operated "floating" ram door can be stopped instantly.

Now Fully Automatic!

New Gar Wood LOAD-PACKER® will save your city more money than ever before

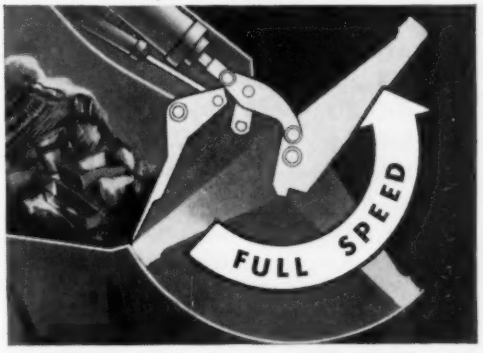


Single "Safte-Matic" control makes compaction cycle fully automatic with just one flip of the lever. Gives crew more time to collect refuse.

That's right! The advanced design Gar Wood LOAD-PACKER is *now 22 ways better*... faster, fully automatic compaction . . . speedier hopper opening . . . single "Safte-Matic" control that speeds up loading and makes accidents virtually impossible . . . low-level, extra-wide hopper . . . tremendous compaction for up to 200% greater capacity.

The advanced design LOAD-PACKER has a simplified hydraulic system . . . strongest body structure . . . new ram through-shaft supported at center and both sides . . . heavy-duty hinges, cross channels and panel brackets.

These and other improvements add up to faster loading, greater capacity, greater safety, longer life, and less down-time for repairs. Wide selection of sizes—from 10 to 24 cu. yds.



Door now opens faster, at full speed all the way. This, plus automatic compaction, adds up to more refuse collected per day.

GAR WOOD GW INDUSTRIES **LOAD-PACKER®**
America's Most Popular Refuse Collection Unit

GAR WOOD INDUSTRIES, Inc. GW-LP-10
Customer Service Dept.
Wayne, Michigan

Please send me the complete story on the advanced designed LOAD-PACKER.

Name .....
Title .....
Address .....
City..... State.....

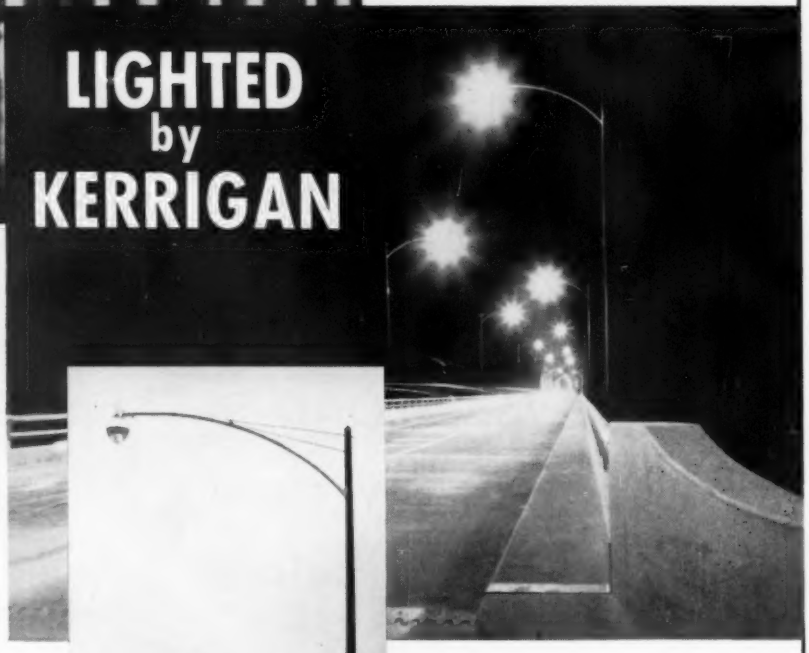
Now's the time to mail this month's Readers' Service card.

Short Cut to KANSAS CITY

LEAVENWORTH Centennial Bridge

is a 6-½ mile stretch of concrete and steel which arcs across the Missouri River to connect Kansas and Missouri at a point where great saving in both time and distance are involved. It serves as a tie for the communities of Waldron, Farley, Beverly, Tracy, Platte City, and Weston to Leavenworth; and provides a short cut to downtown Kansas City.

LIGHTED by KERRIGAN



At the crossroads of Mid-America the newly completed Leavenworth Centennial Bridge is hailed as a model of efficiency combined with graceful design and as a symbol of future progress—a true monument to the vision of the men who planned it.

The LIGHTING of this bridge was part of this master plan; and the 30 tall and tapered KERRIGAN LIGHTING STANDARDS using 6,000 lumen lamps provide modern, bright as day lighting that is a true source of pride to the architects and engineers, Kerrigan's continuous tapered, octagon shaped standards, *Weldforged* of high strength, low alloy steel combine maximum strength with beauty of design.

KERRIGAN Lighting Standards meet the highest engineering standards and conform to I.E.S. Street Lighting Codes. If your city is in need of modern street, highway, or bridge lighting we invite you to consider KERRIGAN, the lighting standard fabricated to weather both the elements and the years. Let us send you detailed descriptive catalog and specifications. Write now for your FREE copy of our new LIGHTING CATALOG.

For better lighted city streets the standard is Kerrigan!

KERRIGAN IRON WORKS, INC.

NASHVILLE, TENNESSEE

General Sales Office 274 Madison Ave. New York City

mail your Readers' Service card today.

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Our Present Position, and Future Goals

DURING THE past several years, much of our pioneer work has matured into reality as our Coilfilters go into operation. In addition to having successful operations, it has been our thought to maintain close relations with the Contractors involved in the building of these plants, the Engineers who do the design work, and the Operators who live with the installations. Despite the trials and tribulations that seem to be a part of this type of work, I believe that we have gained many friends among all the people involved in these projects.

With reference to sludge dewatering technology, we can see a distinct trend toward the direct dewatering of raw sludge on our Coilfilters. On installations operating to date we have been able to find an answer for the odor problem. This, of course, is a large factor, in addition to the economics involved.

With regard to the future, we believe that research, both theoretical and applied, is indicated on the fundamentals of solids agglomeration. We have been fortunate in being able to set up an organization with facilities to do work along these lines.

In perspective, we believe that a splendid job has been done in the past five years on sanitary installations in this country, and are indeed gratified to be accorded a place in this work. Currently our proportion of total sludge dewatering installations is very impressive and we intend to maintain our position through continued service to the Engineers, Contractors, and Operators.

Respectfully,
T. R. Komline

KOMLINE-SANDERSON
ENGINEERING CORPORATION
MANUFACTURERS OF THE COILFILTER
PEAPACK, NEW JERSEY

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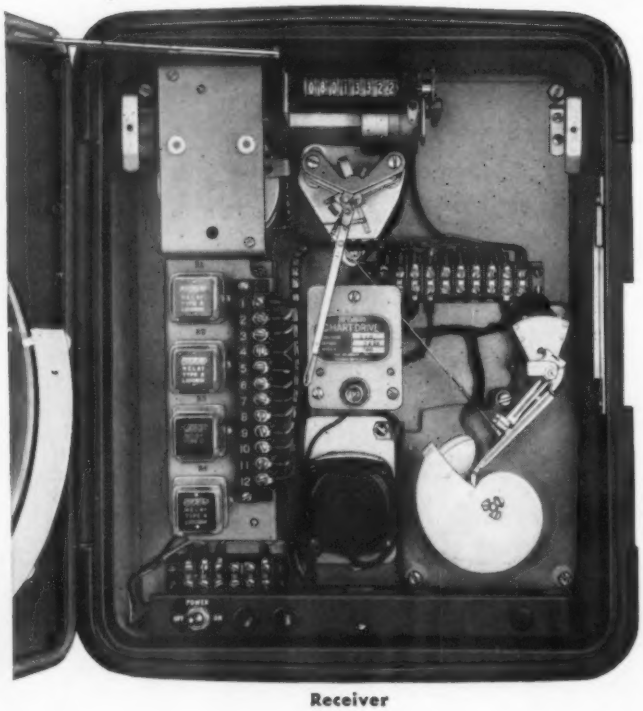
two wires
one wire and ground
radio or microwave
carrier current



Receiver

You can now get the full benefit of Foxboro accuracy and reliability for *remote* measurements, too! Teletax, the Foxboro impulse-duration system, brings new durability and simplicity to telemetering. For example, in the compact Teletax Receiver, dust-proof, plug-in relays and a husky reversing motor drive the recording pen positively. Maintenance is all but eliminated. And when servicing *is* necessary, *every* component is easily replaceable as a separate unit.

Teletax will transmit any measurement made with standard Foxboro measuring elements. Accuracy is ½% of full scale . . . regardless of normal variations in signal strength. Get full details on Teletax efficiency and economy. Write for Bulletin 17-11.

Most Practical System You Can Get!

RELIABLE: Thoroughly proved in actual field installations.

ECONOMICAL: Operates on lowest-cost transmission circuits.

LOW MAINTENANCE: A few drops of oil in the receiver motor every three months is all that's required; low 5 ma dc signal avoids failures.

Single or dual transmitter or receiver; indicating or recording; totalizing available.

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(impulse-duration) Telemetering

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

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For Better Ice and Snow Control Next Winter...

A PLAN OF ACTION

NOW!

ORDER YOUR STERLING ROCK SALT EARLY AND PLAN ITS DISTRIBUTION TO STRATEGIC STORAGE POINTS

Salt Storage NOW is the Key to Storm Strategy LATER!

THE BIG COST VARIABLE in your budget is for man-hours of crews and equipment. If, under emergency conditions, they must haul salt cross-town or cross-country to get it to where it's needed—your costs go up.

Sterling Rock Salt . . . ordered now . . . and distributed to your key pick-up points in advance . . . avoids costly waste motion of crews when the storms come. Your men and machines are a striking force . . . not a supply train.

And don't worry about storage losses, either. The free booklet, offered below, shows many ways Sterling Rock Salt can be stored easily, safely and economically . . . indoors or outdoors . . . without loss.

Avoid Last-Minute Confusion! Save Money!

ORDER YOUR

STERLING AUGER-ACTION ROCK SALT

NOW!

INTERNATIONAL SALT COMPANY, INC.

Scranton, Pennsylvania

SALES OFFICES:

Atlanta, Ga. • Chicago, Ill. • New Orleans, La. • Baltimore, Md. • Boston, Mass. Detroit, Mich. • St. Louis, Mo. • Newark, N. J. • Buffalo, N. Y. • New York, N. Y. Cincinnati, O. • Cleveland, O. • Philadelphia, Pa. • Pittsburgh, Pa. • Richmond, Va.

Save money by using trucks and crews in slack periods during the next month or so to place Sterling Rock Salt under protective covering at key locations . . . *where* you want it *when* you'll need it.

When storms hit, streets and roads are cleared promptly. No last minute confusion. No duplication of effort—or of costs in transporting and handling rock salt. It's already there, where it's needed—according to *plan!*

Send for FREE Booklet,

"HOW TO PROVIDE LOW-COST ROCK SALT STORAGE"

11 ways to store safely, economically— indoors or outdoors.

Thousands use our Readers' Service card to keep up to date . . . do you?

You cut road maintenance and construction costs automatically with the LITTLEFORD 101 UTILITY SPRAY TANK!

Single unit does any kind of patch work. The Littleford 101 Utility Spray Tank comes equipped with a circulating spray bar up to 10-ft. wide for small application jobs . . . there's a hand spray attachment for patching by hand . . . and there's an outlet for filling pouring pots for small crack and joint filling.

3 mounting types to choose from . . . (1) as a 2-wheel trailer, (2) truck mounted type, or (3) 4-wheel trailer. You'll save in many other ways, too, and we're prepared to prove it.

Get the facts before you buy!
Send for Littleford bulletin Z-5

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CONSTRUCTION CASTINGS

for **Highway • Municipal • Building**
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Patterns for 15,000 different Gray Iron Castings used on Construction Projects.

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Catalog "R," Second Edition

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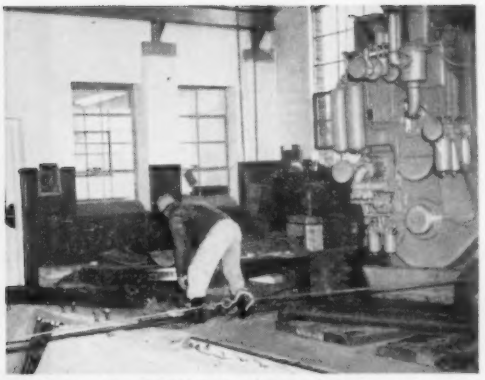


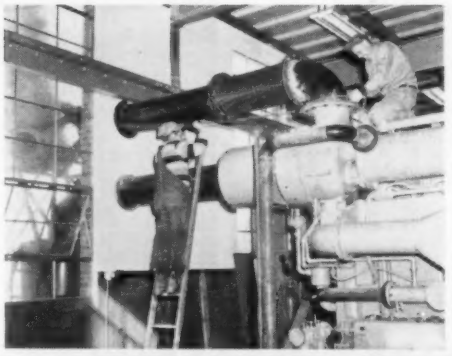
The Enterprise DGSQ Turbocharged Dual Fuel engine is moved into place as a unit. With 16" bore and 20" stroke, it is rated 1422 HP at a speed of only 360 RPM.

Fourth Enterprise Engine arrives at Belleville under protective wraps of all-weather tarpaulin. This new addition adds 1000 KW to plant's capacity.

Bright Power Picture at Belleville: Better Schools and Streets, with Lower Taxes!

"We recently installed the fourth Enterprise Engine in our 100% Enterprise Dual Fuel plant. Our excellent experience with this equipment over the past eight years has proved it to be our best buy in engines. Operating and maintenance costs have been consistently low, greatly reducing power costs and helping make Belleville one of the most thriving and progressive cities in the middle west. We have better schools and streets, lower taxes, above-average recreational facilities, and many other advantages enjoyed by only very few cities of similar size."

Earl E. Whitney, City Manager
Belleville, Kansas

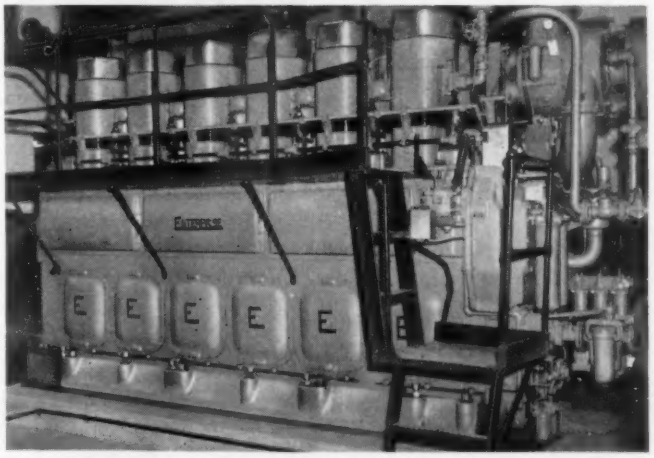


Installation nears completion as exhaust stack and muffler are installed. This "all Enterprise" plant, with its 2500 KW capacity, now has ample dependable reserve power for any emergency, future growth.

City managers, municipal engineers, superintendents – all those concerned with the growth, the future, the prosperity of their community, can look to Enterprise Engines confident they will get this same kind of dependable and economical power-generating performance.

Enterprise Engines – Diesel, Dual Fuel, Spark Ignited Gas – serve every municipal need

The most modern engineering advances are reflected in every Enterprise model, from 73 to 6933 HP, for stationary or portable electric service, flood or water pumping systems, sewage plant power. See the Enterprise sales engineer in your area, or contact us direct for information or help with your plans.



New member of the all Enterprise power team is cut in on the line. Low maintenance cost, excellent service record, and over-all economy of the Enterprise engines already in use were the big factors in its selection.

Over a million horsepower at work the world over!

ENTERPRISE
dependable **ENGINES**

ENTERPRISE ENGINE & MACHINERY CO.
Subsidiary of General Metals Corporation
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Get full details of this month's products . . . mail your Readers' Service card today.

DELIVERING WATER CHEAPER

HOUSTON, TEX.

Lockwood & Andrews engineered this 37,920-foot Dresser-Coupled steel line to alleviate water shortages in rapidly growing East Houston. Installed by George Consolidated, this 36-inch steel line was laid under varied and unfavorable conditions, with cover ranging from 3½ to 13 feet.

Water Stays In...and Out

DRESSER-COUPLED STEEL LINE INSURES AGAINST WATER LOSS AND INFILTRATION

Running silt, shifting sand, water from a nearby ship canal . . . three good reasons why Houston specified steel water pipe joined with Dresser Couplings.

City engineers bought, in effect, a "packaged pipe line"—easy to lay out, easy to install, accurately predictable as to cost.

And despite adverse conditions, the job proceeded smoothly. Long, strong lengths of steel pipe—lighter in weight and requiring fewer joints—cut down installation time. Dresser Couplings made joining fast and simple. Bottle-tight sealing gave 100% assurance against leakage at the joints or possible ground water infiltration in the event of pressure drops.

Looking to future economies, the picture is equally bright. A Dresser-Coupled steel line is virtually indestructible, free from costly maintenance. It's a sound, secure, long-term investment in *delivering water cheaper.*

Gasket and follower ring were put on outside ditch.

√ *Wherever water flows, steel pipes it best.* Always put steel pipe and Dresser Couplings in your specifications.

DRESSER®

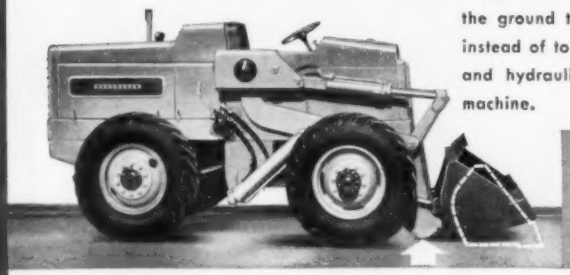
75th ANNIVERSARY THE DRESSER WAY 1880-1955

Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales offices also in: New York, Philadelphia, Chicago, Toronto.

Three completely New PAYLOADER® tractor-shovels with new "more-yardage" features

POWERFUL PRY-OUT ACTION

Tremendous pry-out force is obtained by using the breakout pads on the ground as a fulcrum for leverage. The load forces opposing the pry-out action are thus transferred to the ground through the pads instead of to the axle, wheels and hydraulic system of the machine.



model HU 1 cu. yd.

40° BREAK-OUT at ground level

You can get HEAPED BUCKET LOADS and you get them FASTER and EASIER WITH THIS NEW BUCKET ACTION. Most important of all — you KEEP BIGGER PAYLOADS—because the bucket can be tipped back a full 40 degrees at ground level before it is raised, eliminating spillage.

model HH 1½ cu. yd.

SAFETY and STABILITY

Special boom-arm shape and positioning keeps moving members out of operator's reach at all positions. Close, low, load-carry position and longer wheelbase provide stability and balance for fast maneuvering — with safety.

model HO 2 cu. yd.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

These three all-wheel-drive "PAYLOADER" units are outstanding examples of Hough's continuing pioneering and leadership in tractor-shovel design. They have more digging power, get big bucket loads easier, can carry them faster and safer.

They are full of other features and improvements that boost output, operator comfort and safety and that lower the cost of digging, scooping-up, loading, moving and piling earth and bulk-materials.

Your "PAYLOADER" Distributor is ready to demonstrate these new units and what they can do — for you.

HOUGH-DESIGN HOUGH-QUALITY

More Horsepower per bucket capacity than any other standard models. Either diesel or gasoline engines available.

Easy to Operate Fullest operator visibility for safe, fast maneuvering; power steering; powerful hydraulic brakes; adjustable seat with molded foam-rubber cushions.

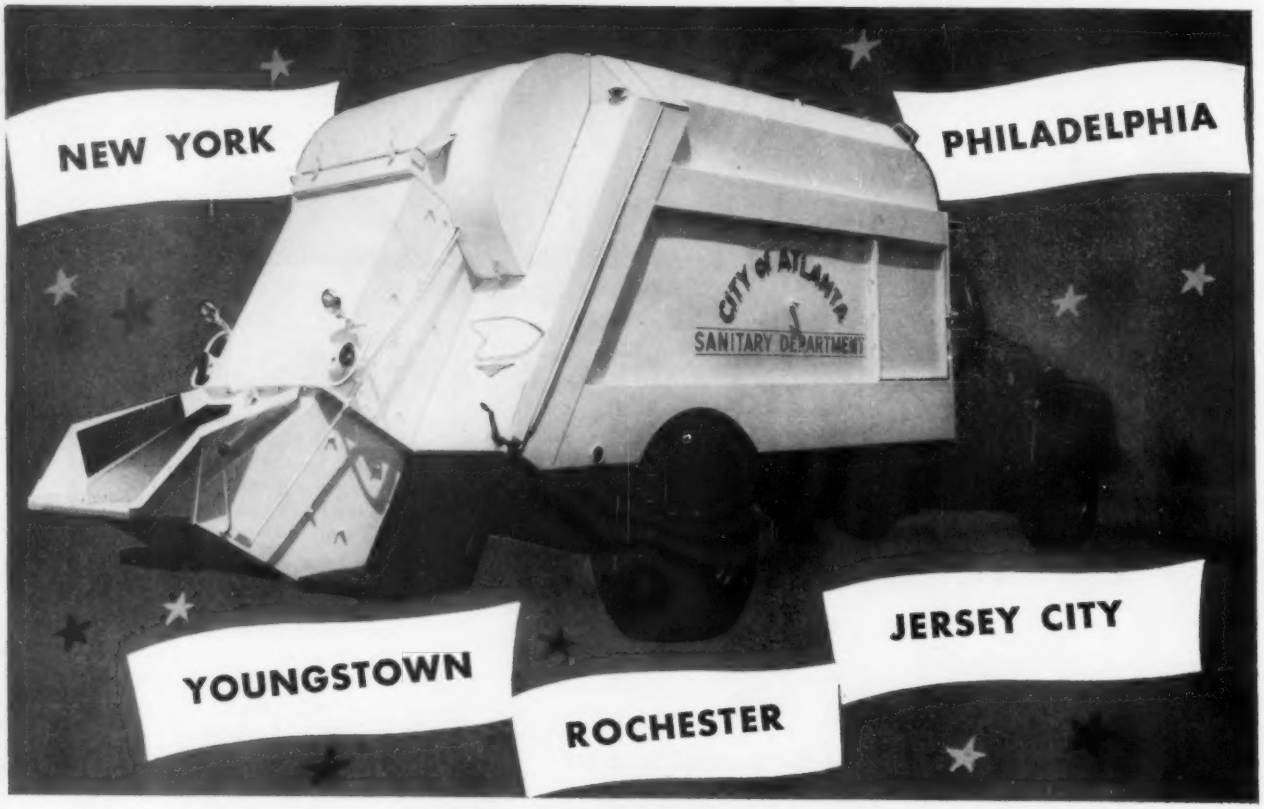
Powerful Transmissions Powershift transmission is standard equipment on the big model HO; four-speed full-reversing types on model HH and HU. Torque converter drives are standard equipment on all models — multiply engine torque up to 350% — act as shock absorbers for the entire power train.

THE FRANK G. HOUGH CO.
761 Sunnyside Ave. Libertyville, Illinois

Send full information on new "PAYLOADER" Tractor-Shovels

- ☐ Model HU 1 cu. yd.
- ☐ Model HH 1½ cu. yd.
- ☐ Model HO 2 cu. yd.

Name .....
Title .....
Company .....
Street .....
City .....
State .....



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WHY?

HIGHEST NUMBER OF LOADS PER SHIFT
GREATEST TONNAGE COLLECTED PER DAY
LOWEST COST PER TON COLLECTED
LOWEST COST PER CUBIC YARD COLLECTED

Make us prove to your satisfaction that the ROTO-PAC can also save money for your community. Investigate the ROTO-PAC now.

SEE YOU AT THE
A.P.W.A. CONVENTION AT MILWAUKEE
BOOTHS A-8 AND A-9

★ *CHECK THESE FEATURES* ★

- AUTOMATIC CONTINUOUS LOADING
- AUTOMATIC CONTINUOUS PACKING
- GREATER COMPACTION
- LOWEST LOADING HEIGHT
- LOWEST OPERATING PRESSURE (LESS ENGINE WEAR)
- HANDLES STRAIGHT ASH LOADS
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- LOWER OPERATION COSTS
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Thousands use our Readers' Service card to keep up to date . . . do you?

water well drillers . . .

Reduce development time by 50% Develop higher initial capacities with

WELTONE

the complete well cleaning preparation for developing and cleaning water wells

The use of Weltone can easily reduce development time on new water wells by as much as 50%, or even more. The high dispersing action of Weltone speeds the safe removal of drilling muds, natural muds, or quartz, mica and silt.

The whole process of developing the well is not only shortened, but since Weltone is so effective at removing the materials which can easily reduce flow, new wells start in at higher capacities than would normally be expected.

Use Weltone for cleaning old wells too. It has raised flows by as much as 500%.

Weltone is economical, easy to handle, and develops no dangerous fumes.

Write for your free copy of this folder.
It contains full information on the remarkable well cleaning properties of Weltone.

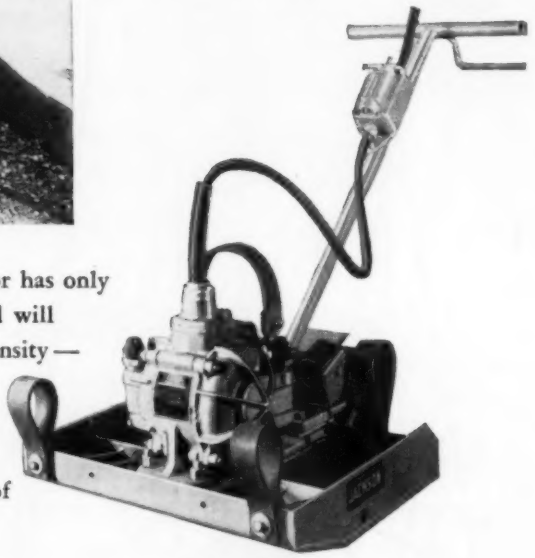
CALGON, INC.

Hagan Building, Pittsburgh 30, Pa.

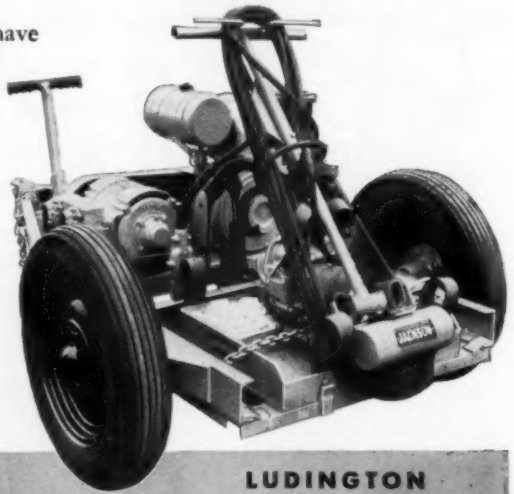
Positively THE MOST EFFICIENT, HANDIEST MEANS OF BITUMINOUS PAVEMENT PATCHING!

JACKSON

MANUALLY GUIDED VIBRATORY COMPACTOR *with* POWER PLANT *on* AUTO TRAILER-CARRIER



The compactor member of this outfit is self-propelling, the operator has only to guide it. It delivers up to 4500 1¾ ton blows per minute and will compact bituminous mixes in 4" to 5" layers close to maximum density — at the rate of 1800 to 2000 sq. ft. per hour. The compactor is operated from a Jackson Power Plant on the auto trailer, and since the trailer has a device for quickly picking up the compactor, it is a very mobile outfit, ideal for the many changes of location required in street patching. It is also very widely and successfully used for paving drives, walks, railway crossings, platforms and similar applications. Both Compactor and Power Plant have thoroughly demonstrated their ability to provide continuous, day in and day out service with a very minimum of maintenance.



EQUALLY EFFICIENT IN COMPACTING GRANULAR SOILS

For compacting granular soils in sub-bases, in trenches and back-fills the Jackson Compactor is a natural. With it densities in excess of 100% of that specified are readily achieved at the rate of 2000 sq. ft. per hour in layers as thick as 10". You'll save many times the cost of this outfit in your first season's use of it. Let us give you the name of the nearest Jackson Distributor where you may see it, or detailed information, if you prefer.

JACKSON VIBRATORS, INC. LUDINGTON MICHIGAN

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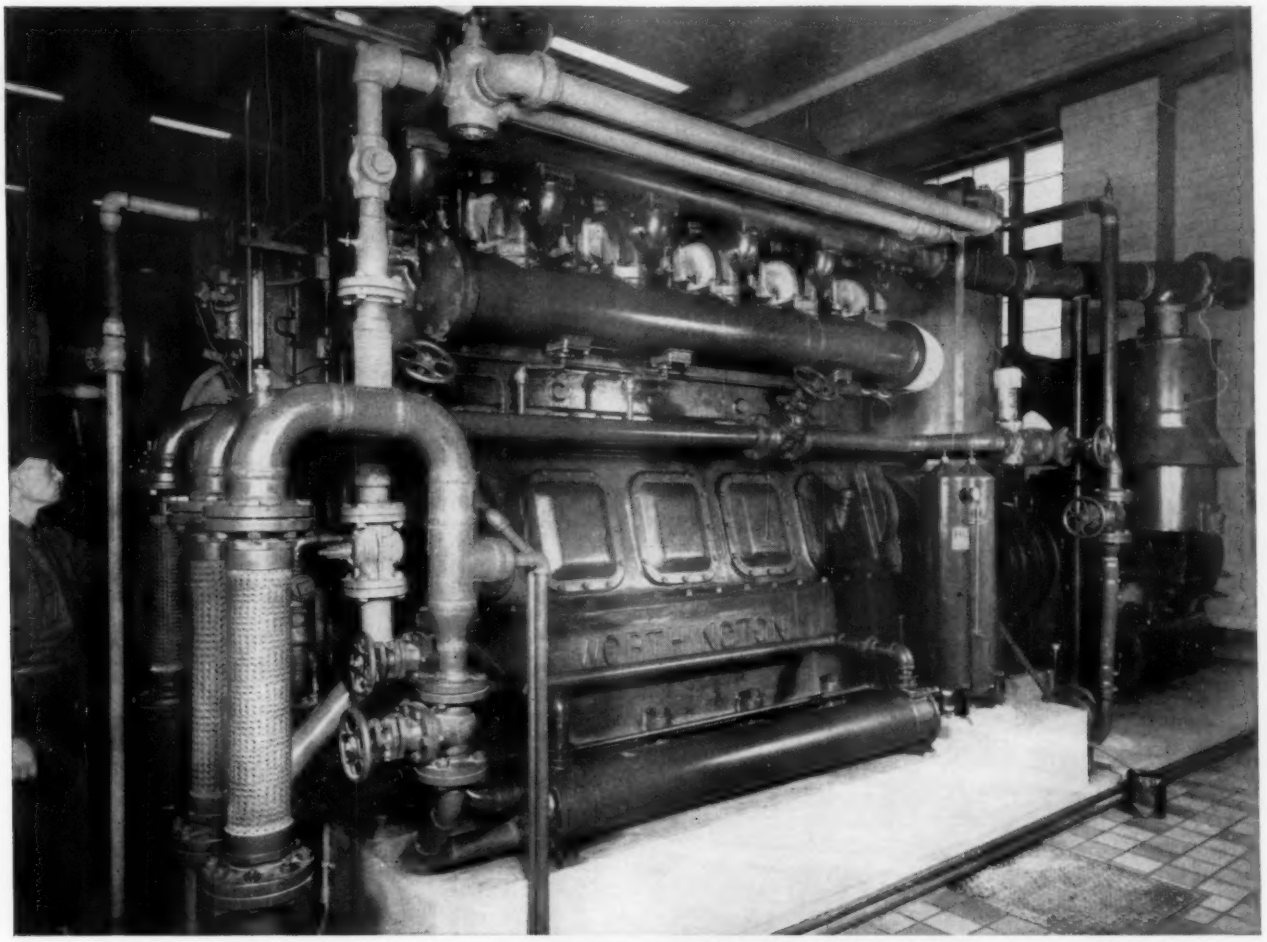
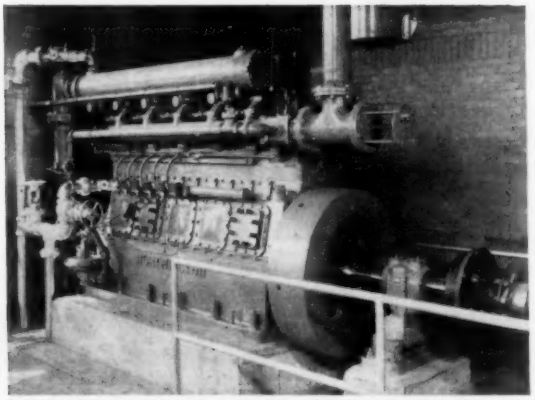


WORTHINGTON SPARK-IGNITION GAS ENGINES, using digester gas for fuel, power blowers at the sewage treatment plant of Canton, Ohio.

Here's the right kind of sewage plant power



ANOTHER WORTHINGTON ENGINE drives a blower in the municipal sewage plant of Elmira, N.Y.

If you're having a hard time choosing between a high-speed, light-duty engine and a moderate-speed, heavy-duty engine, here's something that may help you.

Reports from sewage plants all over the country show that heavy-duty engines not only last far longer but actually cost less in the long run than light-duty units with a slightly lower first cost. Those same reports reveal that Worthington engines have set most of the records for low-cost, *dependable* power production — whether it's for driving blowers, pumps or generators.

Our Bulletin S-500-B36D tells all about the rugged, heavy-duty Worthington engines. Write for it today to Worthington Corporation, Engine Division, Harrison, N.J. E.5.2

WORTHINGTON

Economical, Continuous Power — Diesel, Dual-Fuel and Spark-Ignition Engines from 150 to 5,000 bhp,

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PUBLIC WORKS MAGAZINE

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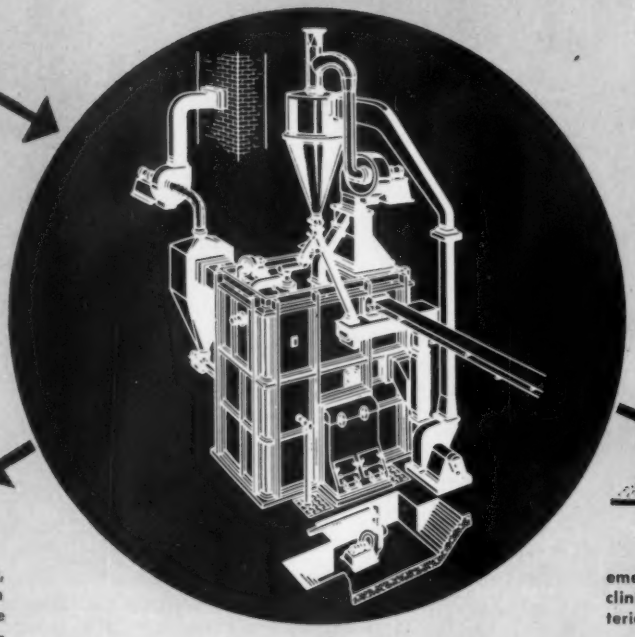
The C-E Raymond System —

the MODERN method of SLUDGE DISPOSAL

SLUDGE

as a vacuum filter cake or thickened sludge from any type of sewage treatment process enters the C-E Raymond System.



SOIL CONDITIONER

emerges as a desirable product, easy to handle, exceptionally rich in humus, and containing the trace elements found in good topsoil.

and / or

ASH

emerges as a fine dust, free from clinker and unburned organic materials.

The C-E Raymond System is the most popular . . . most versatile on the market today. It combines the principles of Flash Drying and Incineration in a single compact system that allows you to Flash Dry or Incinerate sewage sludge alternately or concurrently. It is available with a high temperature deodorization system that assures odor-free operation.

Flash Drying by the C-E Raymond System is a continuous process in which vacuum filtered sludge — if uncontaminated with undesirable industrial wastes — is efficiently heat dried to a marketable soil conditioner retaining all its original nitrogen, but eliminating the objectionable qualities of the original wet sludge. In a well designed and operated "activated plant" the revenue from the sale of soil conditioner is sufficient to cover a sizable part of plant operating costs.

Where the production of soil conditioner is not desired or the sludge is unsuitable, it is flash dried and then completely burned in suspension to an easily disposable, sterile ash.

The services of C-E specialists are available to help you plan for the end of atmospheric or stream pollution in your community, as has been done in so many others. For specific recommendations on the most practical answer to your sludge disposal problems, get in touch with the Combustion office nearest you.

C·E

B-860

COMBUSTION ENGINEERING

RAYMOND DIVISION

1315 North Branch Street, Chicago 22, Illinois

Eastern Office: 200 Madison Avenue, New York 16, N. Y. *Western Office:* 510 West Sixth Street, Los Angeles 14, California

also flash drying and incineration systems for industrial waste disposal

Need more facts about advertised products? Mail your Readers' Service card now.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

DETACHABLE CONTAINERS

Keep Streets Clean and Cut Labor Costs

WM. B. HOLMES

Director of Public Works

Lubbock, Texas

● **DETACHABLE container system is used in 17 blocks in business area of the City. Education of users was a big factor in immediate excellent results of use.**

LUBBOCK, located on the south plains of Texas, has steadily maintained its position as one of the fastest growing cities in the Southwest. From 71,747 at the time of the 1950 census, Lubbock has increased 64 percent to its present population of 118,000. This phenomenal growth, based on an economy of industry, agriculture and wholesale trade, has increased the need for municipal services accordingly. The collection and disposal of garbage and refuse, one of the more essential services, could not be and was not neglected in planning for this unequaled growth.

During the abnormal growth of Lubbock the sales volume and consequently the volume of trash and garbage to be removed more than doubled in the downtown business district. In order to maintain the reputation of this district for clean streets and alleys more and more planning was necessary.

In making these plans two prime considerations became apparent. The daily wind velocity in Lubbock according to Weather Bureau records averages 13.8 mph and during February, March and April this average increases to 16 mph and it is not uncommon for us to have 30 to 35 mph winds. These winds coupled with rather large buildings tend to create air currents making our alleys rather difficult to keep in an entirely satisfactory condition.

But they were kept clean. At first, the addition of another truck and crew solved the problem; however it soon became apparent that we were reaching a point of diminishing returns and that a new approach was needed in this particular area. In the spring of 1954, on hearing of the success of Clovis, New Mexico, and Pampa, Texas, with the Dempster-Dumpster detachable container system, surveys were made to determine the practicability of such a system here. The able assistance of the Sid Patterson Company, Texas and Oklahoma distributors for Dempster Bros., Inc., was utilized in this survey. The results of the investigation strongly pointed toward the use of a detachable container system in our downtown business district to accommodate future increases in trash and garbage as well as in improving our present operations.

After conferences with approximately seventy-five interested downtown property owners, all of whom recommended approval of the new system, the City Commission received bids on a detachable container system and approved the purchase of such a system from Dempster Brothers. Installation of Dempster-Dumpster took place here in March, 1955.

Realizing that this new method of trash collection would require a change in the daily habits of its users, the help of local television stations, radio stations and newspapers was recruited to assist our supervisory personnel in the in-

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● ONE of the 12-yard containers at the disposal area; 22 of these are now used to service 17 blocks and plans are under way to cover 27 additional blocks.

struction program which was an integral part of the installation of this new system.

The new system includes the use of one large 12-yd. container in the center of each of twelve downtown blocks and the use of two 12-yd. containers in the center of each of five other downtown blocks. Since we have cross alleys, it was possible to locate the containers at the center of the block, which equalized the walking distance necessary for the merchants to make use of the containers. There is an average of twenty-six business establishments in each block using these centrally located containers for the accumulation and storage of their garbage and trash.

When the container was installed, every user in each block was personally contacted and given a complete explanation of the requirements of the system and how it would dovetail into his particular operation. The installation was well planned and was carried out methodically with the approval and endorsement of nearly 100 percent of all affected citizens.

By the end of the first week of operation, it was apparent what this detachable container would do for us. Where we once had over a thousand drums lining the alleys under the old system, we now have only twenty-two 12-yd. containers performing the intended function in a much more satisfactory manner.

Our streets and alleys in the seventeen square block area now being serviced with the Dempster-Dumpster System remain virtually free of wind-blown trash while badly needed packers have been released for service in residential areas. Sufficient storage space now exists to permit merchants to accumulate and store their refuse outside of their buildings at any hour in completely enclosed windproof and fireproof containers.

In view of the results we have obtained, our plans for Fiscal Year 1956 include expansion of this new system to service an even greater commercial area in Lubbock. A joint survey and study by our supervisory personnel and the Sid Patterson Company has been completed for twenty-seven additional square blocks adjacent to the area now being served. During this recent survey, a study was made to determine the actual labor savings now accruing to the City of Lubbock as a result of our change from the old system to the new system. The results of that study indicated the following:

Table 1—Labor Requirements

OLD SYSTEM

	Hours per Week per Man	*Annual Cost*
1 Driver	52	$3,190.72
2 Helpers	52	6,111.04
1 Sweeper	52	3,055.52
1 Driver	24	1,410.24
3 Helpers	24	4,043.52
Plus 8% for sick and vacation leave		1,424.88
Total		$19,235.92

DEMPSTER-DUMPSTER SYSTEM

1 Driver	48	$2,945.28
1 Driver	28	1,572.48
1 Sweeper	48	2,695.68
Plus 8% for sick and vacation leave		577.08
Total		$7,790.52

Amortization of our original investment of approximately $25,000 for all necessary equipment is expected within two and one-half years by labor savings alone.

Lubbock has been acclaimed the cleanest city in Texas and we now feel that our position has been strengthened among the cleaner cities of the nation.

● VARIATION on the method used at Lubbock is the Dempster-Dumpster GRD 304-F, shown here in service in Atlanta, Georgia. A fork-lift truck picks up the loaded containers and empties them into a packer-type body as shown here, or into a large trailer for hauling to the disposal area. The body is a 32-yd. Pak-Mor Special; the container 8-yd. This protects from wind or spillage.

Miami Modernizes Refuse Disposal Facilities

From An Interview With

ERNEST A. FORT, Director, Department of Public Service, City of Miami, Florida

A FORWARD step in a long-range program of modernization for the City of Miami's refuse disposal equipment and facilities was completed in January. The city now operates a fleet of refuse collection trucks which are 100 percent enclosed, packer-type units and it has a new 900-ton incinerator.

Improved refuse collection and disposal, from both a sanitation and dollars-and-cents point, will be the immediate benefit from this modernization. A secondary benefit, but one which is considered just as important, will be the long-range favorable effect of modernized refuse disposal on the millions of visitors who annually make the Miami area one of the foremost vacation spots in the world.

Fame as a vacation area forced the city into this program of modernization. The years immediately after World War II brought the area an influx of hundreds of thousands of visitors over prewar totals, plus an increase in year-round residents. These have swelled the Miami area's population approximately 60 percent in the last ten years. The refuse production of these people overwhelmed and outmoded disposal facilities. Trucks were too few to provide adequate refuse collection service and incinerator capacity much too small to dispose of the refuse load.

A program of modernization was started in 1948 to solve these two problems—collection and disposal—as well as to achieve as clean a city as possible for its year-round residents and to promote vacation and tourist business. The refuse collection problem was tackled first because it was basically more important than the disposal problem, and limited funds prevented both problems from being solved at the same time.

The first step called for the addition of new refuse collection trucks to the fleet, including the replacement of all open body trucks with modern, enclosed packer trucks. Enclosed packer trucks were selected because of better sanitation, better appearance and the ability of fewer trucks, because of compaction, to handle the increasing loads of refuse.

Purchase of packers was begun in 1944-45 on an experimental basis. Although they cost more initially, and experience with the first units showed that they were more expensive to operate on a unit basis, savings in labor and travel time, and the need for fewer trucks, offset these costs. The purchase of packers continued each year until all of the refuse collection trucks operating from the main incinerator plant were replaced with packers by the purchase of 27 units at the end of 1954.

Miami now operates 74 packers to serve the approximately 300,000 year-round residents and their many thousands of annual visitors. These units include two Pak-Mors, 19 Leach Packmasters and 53 Gar Wood Load-Packers. The 27 packers purchased at the end of 1954 to complete the fleet were extra-large size units—twenty-five 20-yard and two 24-yard bodies—in order to take advantage of labor and travel savings because of large load capacities.

There are 4 laborers plus a driver on each packer. Garbage is carried out from the rear of residences, which receive two refuse collections each week. Businesses that pay ex-

(*Continued on page* 185)

● **PACKER trucks save in labor and travel time and fewer trucks are needed to provide first class service. Miami now operates 74 of these modern vehicles.**

Milwaukee's REFUSE

GEORGE C. ASHTON,

Sup't., Bureau of Bridges & Public Bldgs., Milwaukee, Wisc.

WITH a population of 587,400, Milwaukee, in 1940, incinerated 45,900 tons of garbage. Ten years later the population was 637,392 and 61,622 tons of garbage were incinerated. This showed a population increase of about 8.5% and an increase of garbage incinerated of 34.3%. In the same period the ash and rubbish collected increased by 30.5%. In other words, Milwaukee is required to dispose of much more refuse per person now than in 1940 and this is probably typical of all of the cities in this country.

The problems of refuse disposal have changed somewhat due to changes in the living habits of the people. As an example, the use of frozen and prepared foods reduces the quantity of garbage and tends to increase the amount of combustibles. The material brought into the plants today contain more paper, cellophane wrappings, wax paper, etc., which are difficult to handle because of their highly combustible nature. Another problem is that dumps are being filled rapidly and most combustible materials that were formerly buried, burnt or dumped, must now be taken to the incinerator plants. This not only increases the burden on the Bureau of Garbage Collection and Disposal but also creates serious problems in burning, such as the emission of fly ash, clinkering in the furnaces and high burning temperatures.

These difficulties are mentioned to give an insight into a problem that confronted Milwaukee in 1950 when it had only two very old incinerator plants having a total capacity of 405 tons per 24 hours. At that time there was agreement that the City needed more incinerators but every one figured that they should be built in the other fellow's neighborhood. The opposition to having a "garbage plant" in a residential neighborhood was tremendous, so a special investigation was made to determine what troubles other cities had with residents. It was very satisfying to find that in most places throughout the eastern part of the United States a majority of the people living near these plants did not even know about them and the only serious objection was the trucks traveling through the neighborhoods. In most of the places visited the operators recognized the problems they could have with the citizenry and made every effort to promote good public relations by keeping the site clean and attractive.

The committee making this investigation submitted such a favorable report that the council appropriated the necessary funds for the design and construction of a disposal plant on North Green Bay Avenue near a newly developed residential area.

The specifications were that the plant would be attractive; that it must not create a public nuisance from the emission of fly ash and objectionable odors; and that the site would be landscaped, kept neat at all times and maintained as an asset to the area. This has been done at the Green Bay Avenue Plant and it will be done at the Lincoln Avenue Plant to the best of the ability of the Department of Public Works.

Green Bay Avenue Plant

This plant was put in operation in February, 1954, and it not only has received public approval but even public praise. In addition it meets the air pollution standards set up by Milwaukee County's Smoke Regulation Department which specifies that the dust in the gases discharged into the open air must not exceed 0.85 lb. per 1000 lbs. of gases adjusted to 12% CO_2.

The building, 89 by 192 ft., has a buff colored face brick, salt glazed tile on the interior and a considerable amount of glass block for light and architectural beauty. The roof is pre-cast cement tile slab with 1 inch of insulation and 4-ply built up roofing. The plant is of the bin and crane type, built on a level site with a large enclosed tipping room, ash removal floor, boiler room, and a two-story wing for the offices, maintenance shop and employee lunch, shower and locker rooms. The stoking is done on the

● **LOCATED near a newly developed residential area, Milwaukee's Green Bay Ave. incinerator is attractive, creates no fly ash or odors and is kept neat and clean.**

DISPOSAL PLANTS....

second floor, 20 feet above is the charging floor.

The pit is 24 ft. wide, 75 ft. long and 18 ft. deep with a capacity of approximately 1200 cu. yds. It is located substantially on the center line of the two furnaces. One Harnischfeger crane, controlled from a moving cab, having a capacity of 3½ tons, and with a 2-yard Blaw-Knox bucket, can feed the furnaces about 200 tons of refuse during 16 hours each day. The Fairbanks-Morse scale is located at the entrance to the tipping room and has a platform 8 ft. wide by 34 ft. long.

The Incinerators

In this plant there are two Nichols incinerators each having a capacity of 150 tons per 24 hours. The furnaces are 16′ in diameter and the combustion chambers are 12′3″, with a volume of 2740 cubic feet. Grate area is 149 sq. ft. Above each furnace is a charging hopper 13 ft. square with a manually controlled motor operated Beaumont Birch charging gate covering an opening of 5 ft. square. Riding over the burning grate is a cone with short arms. These arms revolve slowly so as not to stir up the fire but just enough to tip the refuse, covering the blow holes and moving the cans, ash and other non-combustibles toward the periphery over the dump grates. About once every four hours the furnaces are "decanned"; that is, the cans, ash and other unburnables are poked into the ash hoppers. The ashes are allowed to cool for a short time and then sprayed with water before dumping into trucks. The ash hoppers are lined with hard burned red paving bricks and have Beaumont Birch manually operated, water sealed gates. Operating temperature is 1800°F.

When the refuse is wet or when there is much more garbage than dry combustibles it becomes necessary to use hot air for drying the material and for combustion air. American blowers are used. In order to heat this air, mixing boxes are used. These are simple boxes with a couple of baffles, built entirely of fire brick. Air at room temperature and some hot flue gases are drawn through these boxes resulting in a mixture that can be varied so that the resulting temperature can be controlled between 60° and 400°F.

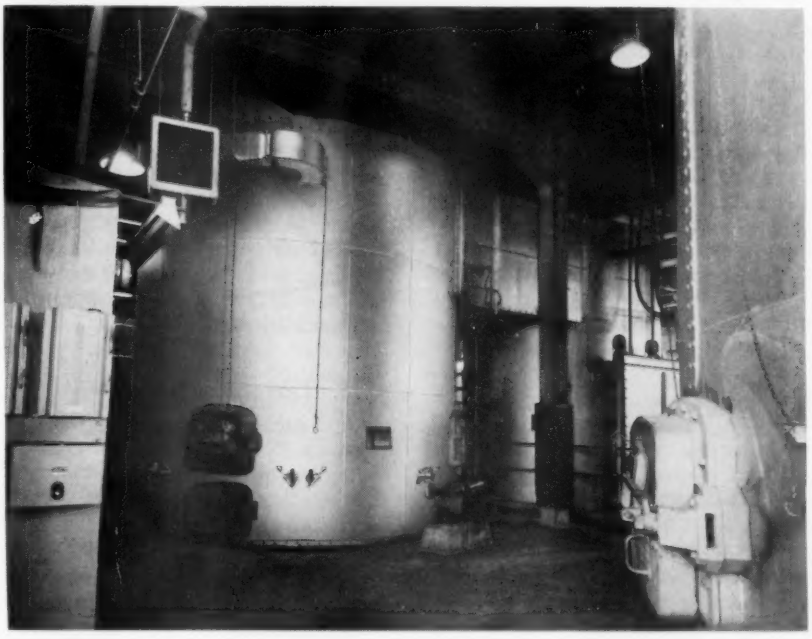
Burning of the gases is completed in the combustion chambers and from there they travel either through the waste heat boilers, the mixing boxes or the scrubber. The scrubber is actually the breeching with specially designed steel baffle plates, kept cool with water sprays, and a V-shaped trough bottom kept filled with water. As the ash laden gases pass through the sprays and baffles most of the ash is removed and washed to the trough.

This scrubber system has a number of advantages besides cleaning the flue gases in that it cools the gases several hundred degrees, helps to preserve the refractories in the breeching and is easily cleaned. Each morning before the fires are started the trough is drained and flushed clean by hi-pressure flushing nozzles which are permanently installed below the water line. This operation takes about 10 minutes. At present all of this ash is flushed into the sanitary sewer but arrangements are being made to install a device to separate the water from the ash, recirculate the water and discharge the ash into ash trucks. A great deal of the spray water is carried along by the gas stream but enough falls into the pond to keep it at a constant level.

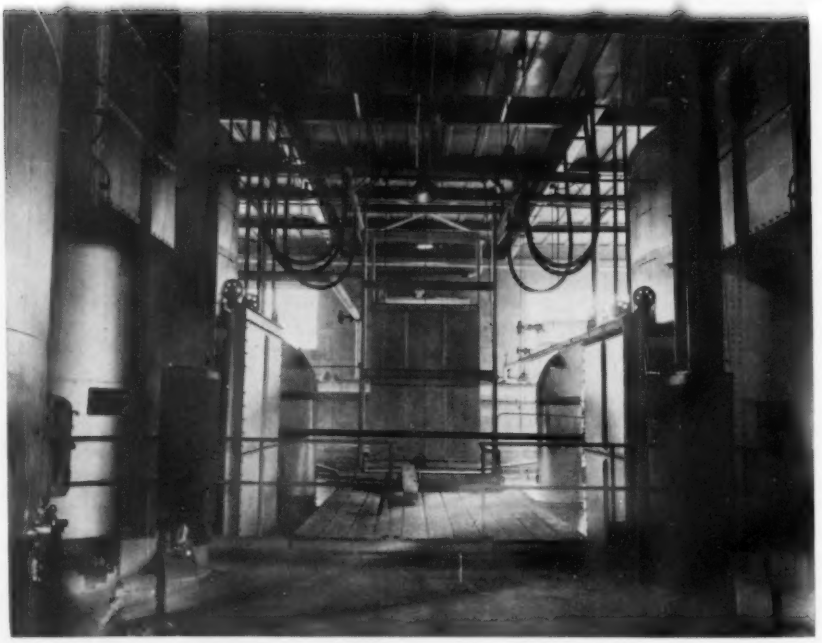
The ceiling of this breeching is a suspended arch made of individually hung super-duty refractory units. The walls are first quality fire brick with hard burned red paving blocks on the bottom extending to about 4″ above the water level. The bottom is made of ordinary concrete with fire hose nozzles permanently installed below the water level and pointed so that the bottom can be cleaned out without entering or using other tools.

Although the sprays are aimed at the baffles occasionally a nozzle wears out and a stream of water hits the fire brick. This does not seem to be injuring the refractory; and, in fact, after more than one year's operation, the inside of this breeching where the water washes it is clean, almost like new brick. There is probably a slight erosion but not more than if only the dry hot gases were passing through.

To cover the openings out of the combustion chambers going into the mixing boxes, the waste heat boilers and the scrubber, water cooled dampers are used. They are operated by a motor driven winch and controlled from the stoking floor.



● **INTERIOR of the Green Bay Ave. refuse incinerator. There are two 150-ton furnaces with 149 sq. ft. each of grate area, and 1850 cu. ft. furnace volume.**



● **STOKING floor of Green Bay Ave. plant looking toward stack; U-shaped flexible hoses are for water-cooled dampers. Cone and rabble arm drives in foreground.**

The absence of odors around the plant can be attributed to good operation and to the ventilation system. All of the air for combustion is brought into the building from one side of the tipping floor through four large unit heaters and through a still larger unit located in the boiler room. Air is blown across the tipping floor and drawn through openings in two ducts, one of which is on the ceiling of the crane runway and the other on the side of the pit at floor level. These ducts enter a plenum and from there the air is drawn through the mixing boxes to the fans and then blown into the furnaces where it is automatically diverted either under the grates or over the fire, according to the furnace temperature. The forced draft fans are run continuously and the speed is manually controlled as conditions require. The ash tunnel is ventilated by two 3000 CFM fans used for blowing cooling air through the cones and rabble arms and supplying some of the primary air for combustion.

The quantity of air brought in through all the unit heaters is about 10.5 lbs. per pound of refuse; the additional amount of air required for burning leaks in through cracks and openings and helps to maintain a slight draft within the building.

With this system of ventilation all of the foul air in the plant is used for combustion and passes through the incinerators where the temperatures are high enough to remove all odors.

Many doubt the wisdom of installing waste heat boilers because of initial costs and maintenance troubles but where the outside temperatures often drop below zero and when large quantities of fresh air must be heated to room temperature it immediately becomes apparent that these boilers pay for themselves in a short time.

There are two 150 BHP Erie waste heat boilers, each equipped with auxiliary oil burners and induced draft fans which are driven by 15 hp motors through a variable speed fluid drive with the speed automatically modulated by the steam pressure. The oil burners are turned on only when the incinerators are not operating and the outside temperature is below 45°.

The chimney, built by Custodis, has an internal diameter of 118 ins. and is 175 feet high. It is built of reinforced concrete with an air space between the concrete and the fire brick lining. A bricked up opening about fifty feet above grade, was provided in case additional fly ash eliminating equipment and an induced draft fan would be required.

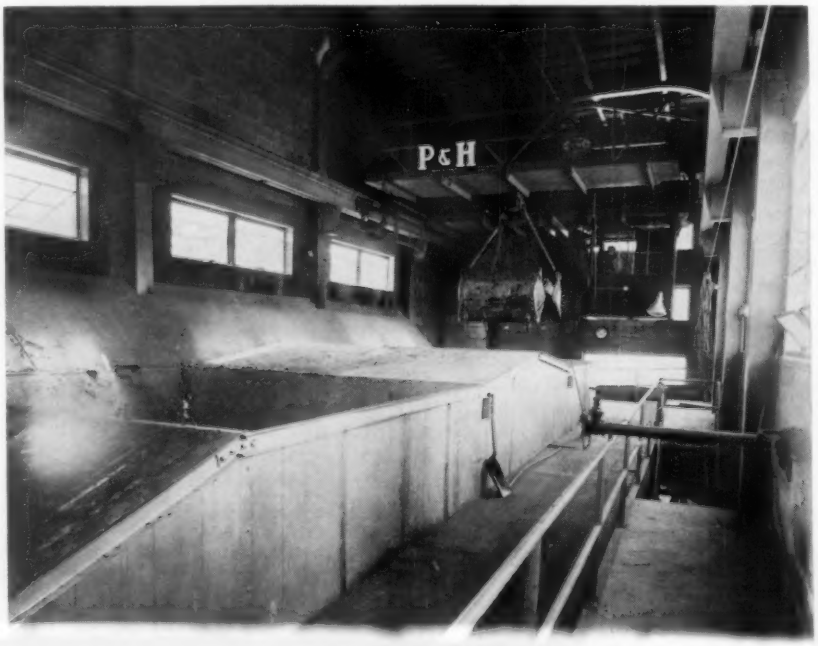
The emissions from the stacks are no more than gray wisps of odorless gases at about 800° F.

Lincoln Avenue Plant

Although this plant has been operating for some time, part of the work is still unfinished, such as the landscaping, driveway, parking areas, etc. It is situated in an industrial area on an old dump site where it was not so important to strive for architectural beauty, as to construct a substantial building that conformed to the surroundings. For this reason most all of the trimmings were eliminated to cut costs.

The building is 138 by 158 ft. The exterior is of a buff-colored face brick with an interior of brown salt-glazed tile blocks. It is standard industrial type masonry construction with large steel sash. The roof is pre-cast cement tile slabs with 1″ insulation and 4-ply built up roofing. The plant is of the bin and crane type and consists of a large enclosed tipping floor, pit, ash removal floor, boiler room, stoking floor, charging floor and single story wing for the offices, scale, shower, locker, lunch and maintenance rooms.

Due to the soil conditions it was necessary to remove a layer of refuse about 16 feet deep, dumped there a few years ago, to get to a suitable load-bearing layer of sand and gravel underlaid with good firm clay. This excavation was then filled with bank-run sand and gravel which was firmly compacted by



● **CHARGING floor, Green Bay Ave., crane in background, furnace openings shown at the left.**

mechanical means. On this fill large spread footings for the walls and columns were built.

The pit is 24 ft. wide, 78 ft. long and 24 ft. deep with a capacity of 1665 cu. yards. It is located in the front of the furnaces. The F-M scale is located at the entrance to the tipping room and has a platform 8′ wide x 34′ long. It is the same type as the one at the Green Bay Avenue Plant. The Harnischfeger traveling crane, controlled from a moving cab, has a capacity of 3½ tons with a 2-cubic yard bucket. It is similar in all respects to the one at the Green Bay Avenue Plant except that it has a bridge span of 54′ 1″.

Incinerators

In this plant there are two Pittsburgh-Des Moines incinerators, each having a capacity of 150 tons per 24 hours. The furnaces are rectangular 11 x 20 inside, and have a combustion chamber with a volume of 2740 cu. ft. built directly in back of the bridge wall. Projected grate area is 220 sq. ft. Stokers are Flynn & Emrich. Above each furnace is a charging hopper 10′9″ wide and 25′3″ long, divided into three sections. Each section has an opening 3 ft. by 4 ft. and is covered by a manually controlled Beaumont Birch motor operated charging gate. The burning grates are divided into three separate sets. They are made up of pie shaped bars resting in trunnions, and inclined at 15° with the horizontal. Each furnace is divided into three cells below the grate surface and each cell has two sections of grate surface, each independent of the other in operation and having its own double acting oil-draulic power cylinders. They are so arranged that alternate grates move together thus advancing the fire bed forward over the dump grates and near the stoking doors. Every few hours the fires are raked to bring down the cans, ash and non-combustibles into the ash hoppers. The ash is allowed to cool for a short while, then sprayed with water.

Each furnace has three ash hoppers lined with hard burned paving brick and having a manually operated ash gate. The incinerators are equipped with Hauck oil burners each capable of burning 90 gallons of #6 oil per hour and located so that the flame sweeps over the fuel bed. These will be used only for emergencies when the refuse is very wet and will not burn without some assistance.

● **LINCOLN Ave. plant, before landscaping. There are two 150-ton Pittsburgh-Des Moines furnaces in this plant which has been in operation only for a short time.**

The burning of the hot gases is completed in the combustion chambers and from there they travel either through the breeching or the waste heat boilers. The breeching leads into the expansion chamber and from there to the chimney. The breeching and expansion chamber contain checker walls and baffles made of fire brick. This is an entirely different design than the Green Bay Avenue Plant in that all collection of fly ash is accomplished without using water.

To cover the openings from the combustion chamber to the breeching and to the waste heat boilers, castable refractory type dampers are used with alloy steel frames. They are operated by motor driven winches controlled from the stoking floor.

Since this incinerator has been in operation only for a short time, it may be premature to state that there will undoubtedly be no odors around the plant. However, complaints of odors are not expected because the ventilation system is similar to that at the Green Bay Avenue Plant.

Fresh air is brought into the building from six large unit heaters. Three are located on the far side of the tipping floor and three near the ceiling of the boiler room. Heated outside air sweeps the tipping floor and is drawn through openings in ducts on the side of the pit and on the ceiling of the crane runway and then conducted to the forced draft fans and blown under the grates. The over-fired air is provided by smaller fans taking air directly from the outside. The forced draft fans are run almost continu-

(*Continued on page* 189)

● **DUMPING into pit at Lincoln Ave. plant. This plant is designed to heat several future nearby city buildings.**

Good Street Lighting

A Sign of Community Progress

BECAUSE civic-minded municipal leaders recognized the need for better streetlighting and attacked the problem squarely and vigorously, Harrison, New York has a new mercury streetlighting installation—a decided improvement and a complimentary addition to its community.

During the initial planning stage, the town officials called in engineers of the Consolidated Edison Company and Westinghouse Electric Corporation to assist them in making their lighting layout. Consolidated Edison furnishes electricity to Harrison (and many other surrounding towns) and they were helpful in laying out circuits and distribution requirements. Westinghouse lighting engineers worked out full lighting performance, pole spacings and luminaire selection. The result: High intensity illumination which makes night-time driving and parking much easier and safer for commuters and shoppers alike.

"Daytime" lighting conditions for Harrison's large parking area and the main street arteries leading to the railroad station and shopping areas is assured by a battery of 50 Westinghouse OV-20 luminaires, each using a 400-watt mercury lamp. Although five times more powerful than conventional incandescent lighting fixtures of the same wattage, these units use only slightly more electricity and have a life expectancy five times that of incandescent lamps.

The installation of Westinghouse OV-20 luminaires in Harrison is the first full-scale adaptation of a mercury system in Westchester County and demonstrates the progress being made in modern city planning. More people are parking their cars downtown at night than ever before and new parking space is being added periodically to handle the increasing traffic.

While the results of the new lighting were immediately apparent, the true criterion could only be determined by the reaction of the townspeople themselves. The new streetlighting received whole-hearted approval, as evidenced by the following statements from some of the town citizens:—

Alfred F. Sulla, Town Supervisor—"In modernizing the streetlighting in Harrison, safety of shoppers and commuters was foremost in our minds. We now have a high illumination level which has been conducive to nighttime parking and shopping. We feel our lighting system has achieved its objective."

Police Chief William Donovan—"As police chief of Harrison, I feel our new streetlighting system discourages crime and vagrancy and our force can do a better and faster job of policing the area with good visibility. It's made our job easier."

Sid Seligson, owner, Seligson's—"Not only is our new lighting system safer, but it has helped focus more attention on our stores in town, giving them attractive nighttime appeal. We feel that good street lighting helps bring in more business."

Mrs. J. Howard White—"Frankly, I was frightened, before our new lighting system was installed, if I had to get into my parked car late at night. I feel much safer now. Many of my friends feel the same way."

The Town of Harrison extends an open invitation to see its new lighting system. You may find the answers to your lighting problems and, at the same time, help promote civic progress in your town.

● **MERCURY streetlighting installation in Harrison, New York, makes streets safer for parkers and shoppers.**

● **DAYTIME lighting is provided by 50 luminaires with 400-watt lamps; for the public reaction see text herewith.**

● **EQUIPMENT used wisely speeds up the work and reduces interference with traffic.**

MAINTENANCE

Resurfacing Procedures

C. A. HARRELL, City Manager, Cincinnati, Ohio

OUR highway maintenance resurfacing has been done by force account by the Highway Maintenance Division of the Public Works Department. Cincinnati has operated its own bituminous paving machine since 1939. This machine, in conjunction with the city owned Asphalt Plant which has been in existence for 25 years, makes for a high quality, low cost, asphalt program in a city of this size. There are approximately 950 miles of improved streets in Cincinnati and a high percentage of these are maintained in asphalt.

In our early years of using a bituminous paver in asphalt maintenance, this work was financed from the normal revenue available for street maintenance work. Of late years, however, because of the demand for eliminating old brick and block type pavements, along with an ever-increasing need to rehabilitate worn concrete pavements, the bituminous resurfacing program became so enlarged that it was necessary to supplement the financing of this division by bond funds to accomplish the work. Last year approximately 576,000 square yards of pavement were resurfaced. Close to half of this yardage was a thin leveling course laid over exposed abandoned street car rails. The program accomplished improved durability and riding characteristics on approximately 40 miles of street pavement.

The 1955 program for resurfacing is even larger than 1954, as 800,000 square yards of pavement are included. About one-third of this area will be coverage over track area only, and when this work is completed all exposed rails in Cincinnati will have been covered.

We have established a five-year machine reserve program and, of course, all of the track area surfaced pavements are scheduled in the early part of the five-year program for full width surfacing.

Machine Patching Method

The mechanical resurfacing of pavements not only has been adopted as a standard and approved maintenance method of inestimable value in rehabilitating old worn pavements, but design of all new pavements includes setting the new surface at a grade approximately 2 inches lower than is normally standard, with 7-inch instead of 5-inch curbs in order more adequately to anticipate the placement of asphalt resurfacing of the concrete type in later years.

A unique feature in repairing pavements with a bituminous paving machine has been adopted in Cincinnati. After experimenting for a period of several years, we have developed a technique for patching asphalt and macadam street surfaces, using the mechanical method in place of the old hand method. Of course, the burning out for this type of patch work varies somewhat from burning in advance of hand work; and, of necessity, the areas surfaced are somewhat larger than those where hand work is used as this can be closely limited to failed areas. While the operation per square yard has been reduced one-half in cost, the nature of the operation requires laying approximately twice as much yardage, so that while no direct saving in dollars is accomplished, more area of the street is repaired. This makes it unnecessary to return to repair such surfaces as soon as was necessary with hand repair work. This is a most interesting adaptation of mechanical resurfacing. One outstanding accomplishment is the much improved surface after patching by machine, as contrasted with the finished work when done by hand.

Cincinnati's machine resurfacing is largely a one-course operation. This was decided upon as a matter of policy in order to conserve curb height and to prevent undesirable interference of grades for drainage and intersecting streets. Some of the average thin 1 to 1¼ inch mats laid as long as 15 years ago are still in good serviceable condition, having been surface treated only once after the mats were 10 years old. When unusual pavement conditions are encountered, it is often necessary to place multiple courses. However, better than 80 percent of our work is accomplished as a one-course operation.

As a result of the stepped up surfacing program planned for the current year and, also because of the steady transition from hand asphalt repairs toward mechanical, the city purchased an additional paving machine, making a total of two. These will operate the entire paving season each year according to our present plans. The city owns a Barber-Greene bituminous paver and a Blaw-Knox pneumatic tired bituminous paver. The City's Asphalt Plant produces approximately 100 tons of asphaltic concrete mix per hour.

Adjusting Street Castings

Extensive resurfacing programs, such as we have engaged in for the past several years, create quite a problem in adjusting street castings of the various utilities, as well as sewer manhole castings and wa-

ter valve castings. Large numbers of these must be provided for in any plan for raising the grade of the streets by resurfacing. In order to expedite mechanical resurfacing operations and to hold down the cost of the work, in past years it was standard practice to surface over all existing street castings, marking them with a special type of block casting approximately 6 inches in diameter which identified the casting underneath the marker as being sewer, water, gas, electric, etc. Then at a later date, when it was convenient for the utility companies as well as the city, special crews went out and raised the castings to the new grade, making a paving restoration around them. However, of recent years, it has been our practice to endeavor to raise all castings ahead of the work, wherever and whenever feasible. This makes a tremendous problem in timing of street repair crews to prevent interference with traffic and, also, to prevent the raising of castings too far in advance of the work so that traffic would experience a long period of inconvenience.

Much use has been made of the special cast iron manhole shim rings, which are bought in large quantities to fit the various castings to be raised. In many instances it is entirely feasible to use these rings to raise the grade of castings without actually digging up and adjusting them.

In the case of the track area resurfacing, which is relatively thin and considered only as advance work toward eventual resurfacing of the street, it is standard practice not to adjust street castings which appear in this area, but rather to rake down to them. Except in unusual cases this practice is quite practical. When this is done it is unnecessary to require the adjustment of these castings a second time when the final wearing surface is applied to the streets. At that time the castings will be raised to the final grade.

● **TYPICAL street before resurfacing, showing street car tracks.**

How

One Sewage Plant

PHIL HIRSCH

A NEW method of chemical treatment has virtually eliminated the problem of froth at the sewage treatment plant serving St. Joseph and Benton Harbor, Mich. The treatment, using a defrother known as "Hodag S-88," involves an automatic application system that produces maximum benefit at minimum cost.

Before the plant began using S-88, froth was a serious problem. It rose as high as eight feet in the three 478,000 gal. capacity aeration tanks. These tanks, 24 ft. wide, 13 ft. deep, and 117 ft. long, each contain two parallel channels. Froth also was generated in channels connecting the aeration and final settling tanks of the activated sludge unit. These consist of a 170-ft. main channel, 2 ft. wide and 5 ft. deep, leading from the aeration tank and running the width of the three final settling basins, plus 41 ft. connecting channels running up each side of these basins.

The aeration tanks provide a 6-hr. detention period at a flow of 4 mgd. Normally, flow is at the rate of 4.5 mgd. in the daytime but falls to 2 mgd. at night; detention periods range from 5.2 to 11 hours. Plant Supt. C. W. Thompson, in contrast to some authorities, believes there is a close relationship between detention time and the amount of froth generated. He reports that at night, when the detention period is longest, height of the froth used to reach its peak. During the day, it seldom rose above two ft.

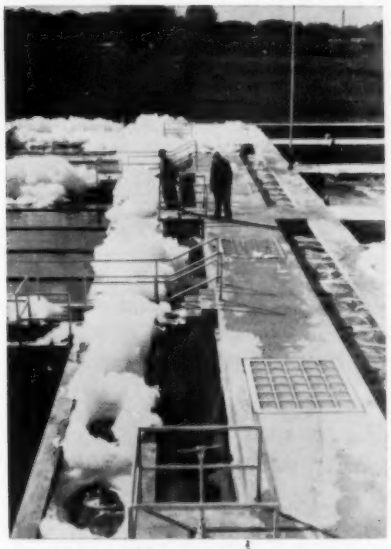
This relationship between detention time and froth height is based on the amount of air per gallon of mixed liquor in the aeration tank, he added. As the length of the detention period increases, so does the amount of aeration per gallon of mixed liquor. The average for nighttime operations is around 3 cu. ft; normal is 1.5 to 2 cu. ft.

Last winter, only one of the three aeration tanks was in operation. Detention time during peak periods dropped as low as 4.6 hours, and practically no froth was generated. Another indication that detention time can be considered a barometer of frothing is that on Mondays, when flow is heaviest (as high as 5½ mgd), the froth would be at a minimum.

With longer detention periods, however, the froth frequently coated walkways in the secondary treatment area with a slimy, slippery coating. Thickness of this coating

● **DEFOAMING starts here: From the drum, defoamer flows through pipe into cup at right, then it is mixed with water in pump and applied in proper proportion to tanks.**

Eliminated Aeration Frothing



● **THIS is the way foam collected in the channels leading from the aeration tanks to the final settlers.**

ranged as high as three-quarters of an inch. Although none of the plant work force was ever hurt, the danger of a fall was always present and undoubtedly added to the time required to perform even simple chores in the tank area.

The froth contained large quantities of bacteria. When it settled on walkways and was eventually dissipated into the grease-like coating, the bacteria were cut off from their air supply and quickly died. This produced the well-known sewage smell, which traveled for quite a distance. Fortunately, the closest buildings to the plant are factories, and they are located quite a distance away. Otherwise, the effects of this nuisance might have been much worse.

Froth also coated pipes and formed a thick layer on windows and walls of a pumphouse near the tanks. It was necessary to clean these surfaces at frequent intervals.

The froth was costly, besides being a nuisance and hazard. Every morning, a workman would have to spend from one to three hours hosing down the billowy clouds that had collected over the aeration tanks and its connecting channels during the night. Cost of the labor involved in this operation came to about $2 an hour, or about $1,400 a year. Even spending this money, of course, the effects of the froth —coated walkways, smell, and increased maintenance—were not prevented, but merely reduced.

The plant began using Hodag S-88 in the spring of 1954. Since then, froth has never built up to a height of more than two feet above the surface, well within the bounds necessary to keep it from covering walkways, creating a smell, and causing a maintenance headache. The chemical, which is basically a glycerin compound derived from petroleum refining, is delivered in 50-gallon barrels. Consumption amounts to about 75 gallons a month at the St. Joseph-Benton Harbor plant. S-88 is priced at 15 cents a pound, or a little over a dollar a gallon. Cost of the treatment comes to about $1,000 a year, Mr. Thompson reports.

At first, the plant crew dispensed the defrother in small metal cans along the sides of each tank and channel at irregular intervals. This treatment was effective for about 20 minutes. Then, unless more chemical was used, the froth would begin building up again. An excessive quantity of chemical had to be used, which increased cost of the treatment.

Instead of the hand application technique, a spray system is now used. The barrel of S-88 is mounted on a stand in the gallery building. The chemical feeds through a control valve into a four-ft. length of pipe. At the end of the pipe, the S-88 flows into a metal cup, and from there through a hole in the bottom into ⅜-in. copper tubing that leads to a 200 gpm. pump. This arrangement provides a visual check on the amount of chemical being used; the amount flowing into the cup can be observed easily.

On the suction side of the pump, the defrother combines with effluent which the pump draws in from a chlorine contact tank adjoining the final settling basins. The mix then flows through 1 to 2½-in. pipe which extends along one side of each aeration tank channel. At 14-ft. intervals, a 5/16-in. dia. hole is drilled in the pipe. The water-

● **AFTER: This is the way the aeration tanks looked after application of defoamer. The picture left above will give an idea of conditions before treatment.**

defrother mix comes out at a pressure of approximately 150 psi. Deflector nozzles, furnished by Link-Belt Co., are mounted over these pipe holes. The deflectors shoot a fine spray, about 50 degrees wide, into each channel, which effectively prevents buildup of froth.

With this system, the plant uses defrother about 10 days out of the month. The rest of the time, a water spray is usually sufficient to control the buildup. In either case, application is automatic. For if the pumphouse valve controlling the flow of Hodag S-88 is shut, the nozzles will dispense sewage effluent drawn from the chlorine contact tank.

Modernizing Sanitation

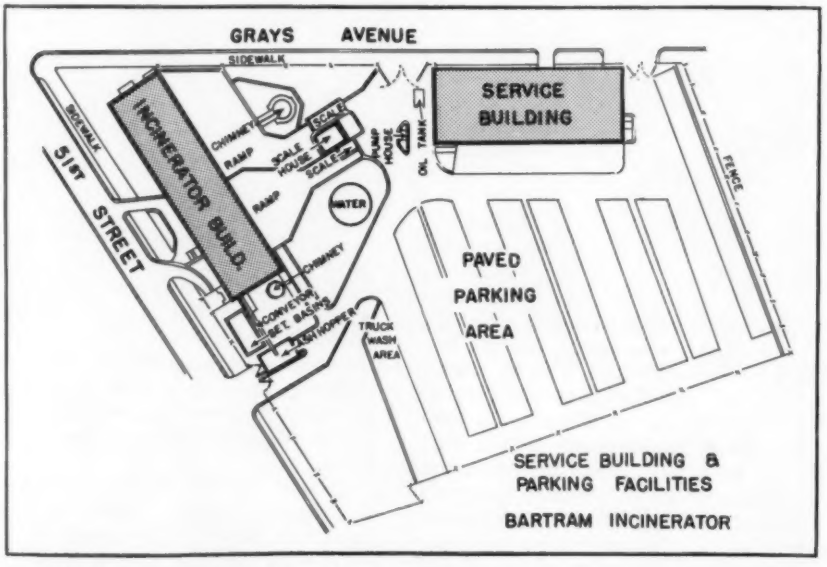
JOHN A. BAILEY, Deputy Street Commissioner, Philadelphia, Pa.

THERE REALLY isn't anything new under the sun in street sanitation, but it is news when a big city does as much to modernize and improve its Sanitation Division in two short years as has been done in the City of Philadelphia since June, 1953, under the direction of Henry D. Harral, first as Deputy Street Commissioner and later as Commissioner of Streets. It became apparent in 1952 that the City would have to replace the horse-drawn refuse collection vehicles and, even though the City had not operated compactor trucks, those in charge of the Division felt that the long jump from horse-drawn collection vehicles to compactor trucks would have to be made in one step. Consequently, in 1952, ten compactors each of two different types (hydraulic and escalator) were purchased and put into trial operation in the late fall. A few weeks usage of these fully enclosed trucks convinced us that citizen acceptance of litter-free collection vehicles would make this big jump worthwhile, even though we knew it would be a more costly operation in some of our narrow streets where the teamster, with his horse-drawn vehicle, both drove and loaded. Putting 350 new compactor trucks into operation in a period of just over two years has not only obtained the expected wide-spread citizen approval, but has also permitted the Sanitation Division to save money because they have proven even more efficient than we had expected; and the efficiency in the more open sections of the city has offset the higher cost where trucks operate under difficulties because of narrow streets.

In 1952, the Sanitation Division had 267 open trucks, 455 horses and a few enclosed garbage trucks, but not a single compactor. We had open dumps for the disposal of all kinds of refuse, supposedly excluding garbage; but, unfortunately, much garbage was burned on the dumps at that time. Incinerators had been discussed for several years, but only one incinerator had been built in Philadelphia since 1927, although the per capita production of combustible rubbish had more than doubled in that time. Incinerators are being built now and, by the end of the year, enough capacity will be in operation to permit cessation of open dump burning. Even though this article is not concerned with the incinerator program, having incinerators in each of our four major geographical areas affected the type of collection vehicle needed. The emphasis was on the speed of loading the vehicle and on total capacity per day more than on the pounds each vehicle will hold per load. The latter is more important when the disposal sites are far away and trucks make only one or two trips per day.

The Personnel Problem

The first impact of these trucks fell on the personnel of the displaced horse-drawn equipment, but the biggest problem which faced us was obtaining competent people to man the new equipment. In planning the orderly demotion and transfer of those men who were connected with horse-drawn equipment, we had completely open negotiations with the union representing our employees on the procedures to be used. In every case, those who were capable of driving trucks had a provisional promotion to truck driver. The teamsters and hostlers who could not drive trucks were demoted to Laborer or Street Sweeper I (a somewhat lighter work than laborer) depending upon their abilities and physical capabilities. It is interesting to note that many employees were staying on only as long as they had their horses, and they retired when horses were eliminated. The Personnel Department had a laborer list with sufficient people on it to man our vacant laborer positions. Finally, we worked out with the Personnel Department a new examination for truck drivers, which consisted of a written examination, and an actual field test for the 686 applicants who passed the written test. The raters from the Personnel Department were trained in driving trucks by employees of the Sanitation Division, which also furnished trucks and competent drivers to ride with the raters and applicants in the practical examination. Although most of our provisional truck drivers passed both examinations, and in a substantially higher percentage than the outside competition, some did fail. Where they had previous Civil Service permanent status, they were demoted to their old jobs; where they didn't have status, we lost them; fortunately, this involved only a few employees.



● **UNDER construction in West Philadelphia is a modern district headquarters, with service facilities, space for making minor repairs and parking for 175 vehicles.**

Operations . . .

These changes have put a terrific burden on the field supervisors who are in charge of the Sanitation districts and on their immediate supervisors. In the past year, we have replaced nearly 60 percent of these men because of their inability to stand the pressure of the change-over. Fortunately, there were many capable people just below the top and, with examinations scheduled at the proper time, we were able to fill most of the jobs from an eligible list by promotion. However, at the level where we have not yet been able to give examinations, we had the supervisors nominate the men they thought most capable of filling the position, and the Sanitation Division had an oral interview with the eight or ten most likely candidates. We appointed provisionally those who seemed not only to be capable, but who also had the verbal ability and intelligence to come out well on written examinations when tested by Civil Service.

● **PUBLIC acceptance of modern refuse collection vehicles, such as this Roto-Pac "Alley Cat" especially designed for alley cleaning, has made the job easier.**

The complexity of new operations required varied training programs. The first gave our middle and low level field supervisors an opportunity to take a work simplification course taught by the Society for the Advancement of Management. These courses consist of twelve two-hour sessions and have opened new vistas to many supervisors. We have just established a broad training program for our lowest foreman level, and are planning to give this course to all our employees who are interested in improving their performance. This comprehensive course, which requires fifteen two-hour sessions was worked up by a committee of experienced street sanitation men, most of whom had come up through the ranks to relatively high positions in the division. It also embodied the theoretical approaches of the Street Department management analysts, and Thomas J. Davy from the University of Pennsylvania, Institute of Local and State Government, brought his wide training experience to the committee. The first session was given to the district and area superintendents on a capsule basis to familiarize them with the content of the course their foremen would take and to obtain their suggestions on material to be included.

We have established a vestibule training course for in-coming laborers and street sweepers in which we attempt to give them a view of their rights and privileges and the rules and regulations of the Sanitation Division; to show them the different types of operations which take place in the Sanitation Division; and to provide actual demonstrations and some training in how the work should be done. This involves about a day and a half and is proving to be of considerable value. We have even talked of retraining the older laborers, in order to familiarize them with the benefits of public employment, which they may have missed. This is particularly important in view of the major changes made during this administration in improving employee benefits and working conditions (which have been achieved in part by an aggressive union of municipal employees — American Federation of Labor, District Council 33, AFMSACE—which has fought well for benefits for its members).

Intensive work has been done on improving supervision on all levels to obtain more efficient and better satisfied employees. In addition to the training mentioned above, we have kept the idea of lower unit cost in mind during the entire period. However, we have not been able positively to identify the areas where we are weak and concentrate our efforts on them, but had to use a broadsided attack. Consequently, our better foremen have been getting better, perhaps even more rapidly than our poorer ones. But, there is a change in prospect for we have a new reporting system to supplement and supplant the one used up to the end of 1954. These reports are being transferred to IBM cards so sortings can be made in various ways and so that the routine reports can be run off quickly. At the present time, we have completed the first five reports for 1955 (each report covers four weeks) and are beginning to check on labor utilization by foremen, by district and by area and by the various types of materials collected in the city. We hope by the end of this year to cover truck utilization, at which time we can check our studies made in 1953 and 1954 when we were purchasing compactor trucks to find if each is delivering what we expected of it; to find which types we will want to buy in

the future; and to encourage the man with the lowest productivity to increase his production.

Cost Reductions

We have already been able to reduce our labor costs slightly while increasing the standard of work substantially. One major improvement is that the added equipment and manpower have permitted the reduction of overtime from an average of $31,000 per week in 1954 to $11,000 per week for the first five months of 1955. This is not only of benefit in saving money but it is also particularly helpful for it permits the man who has worked only seven or eight hours to be back at work the next day fresh and ready to handle that day's assignment.

We have been able to reduce substantially the amount of sick leave taken by our employees by instituting a visit by a trained inspector to each employee on his first day off to ascertain if he is definitely sick and to see if there is any assistance we can give him. This policy has recently been modified to eliminate the first day visit to men who have good records. Written warnings have been given to the employees whose "awol" time is excessive and the union has also been notified of this warning. The union, in turn, has joined in warning the employee when his work record is not satisfactory, and urging him to present himself for work regularly or make provisions to be off when he needs time for personal business. Many employees who did not meet these standards have been discharged.

The Street Department, with its union leaders, has formulated joint Labor-Management Committees throughout the department, but I will describe mainly those in the Sanitation Division. They are staffed by members chosen by the union and by management. They meet to discuss ways to improve working conditions, to simplify work and to find common solutions to the problems which beset any large organization. One committee covers our disposal plants, another covers our maintenance people, and there is a committee in each district for the lifters and sweepers. They are guided by a central committee of top level union and administrative people in the Division who set challenges for and review suggestions which the lower committees have not been able to resolve. Many of the suggestions have such merit that the top supervisor in the committee, who has adequate authority to run his division, has been able to put them into operation immediately; while others, which are division-wide in scope, have come into the central committee and have been handled by the top supervisor sitting on that committee, the Chief of Sanitation Operations— William W. Griffin—who has authorized the installation of many suggestions. Of course, there have been suggestions which could not be put into effect because of budget limitations; others which fall outside the division's scope have been referred to the Street Department Executive Committee; and some which even exceed departmental scope have been passed on to proper agencies of the City government when they are thought to have merit. Many of the suggestions are small, but they produce employee satisfaction. Obviously, a suggestion system which is part of our labor-management cooperation program requires funds for rewards because the employee making the suggestion has generally gone further than he would be expected to go. It has not been possible to date to get appropriations from City Council for this, but it is my hope that such can be done in the next few years. However, under City regulations, it has been possible to use the profits from vending machines which are in Street Department facilities to give small rewards for the best suggestions.

Building Progress

Two years ago, the operational facilities of the Division were in poor condition. In many cases, they were rented, they were ill-adapted to our needs, they were originally used for horse-drawn vehicles and for stables or, as in the case of incinerators, were just worn out. Today, our incinerators are being rebuilt with the best possible locker and toilet facilities for our men. We have been able to begin construction in the West Philadelphia area of a modern district headquarters. It is smaller than we like, but we had to fit our pattern to the appropriation for the facility. It provides paved parking area for 175 trucks, an enclosed garage space for making minor repairs and for preventive maintenance including greasing and washing of trucks. It also has sufficient space for headquarters operation, and one room which can be used for union meetings, for training programs, or for other needs. Even before that, we had been able to make major changes to our maintenance garage at 26th and Glenwood Avenue, an old City-owned stable. The roof was raised and put on steel supporting members taken from some bridges that had been demolished, using Street Department Bridge forces. Sanitation Division Maintenance employees did the necessary plumbing and heating and electrical changes to make this an adequate headquarters. It was the first we had ever had. We expect that the next capital budget will provide funds to build two more of these garage headquarters in 1956 and the final two in 1957, for the savings will amortize the cost in a few years.

In 1953, it became apparent that some major changes would have to be made in the layout of collection routes in the City, both to increase efficiency and to reduce interference with traffic using the streets of the city. The first change was to convert the heart of the main business district to night collections. This was studied quickly and put into operation in June, 1953. Of course, we found several "bugs" in

● **LEFT TO right: A 16-yd. Roto-Pac on Brockway chassis; a 9-yd. Gar Wood on an International chassis; and a 6-yd. Roto-Pac on Reo; Dempster-Dumpster in rear.**

● **THE 350 new compactor trucks put into operation in just over two years have proved even more efficient than expected, have saved money and gained praise.**

it, and we have made many small shifts to try to eliminate the impact on areas where people are sleeping and on the Wednesday evening business hours. We have not been able to eliminate complaints entirely, so we are again studying the whole area and believe changes can be made which would eliminate more of the complaints.

The South Philadelphia district has been completely revised. The two divisions once started at Broad Street on Monday (one route traveling east and one route traveling west), so that by Friday they were at their maximum distance apart. In making the revision, we began both routes at the Schuylkill River on the west side of the area; both are operating parallel north and south routes progressing toward the east day by day, so that they end at the Delaware River on Friday. This permits rapid interchange of equipment on any day of the week (instead of on Monday alone) when one route may be ahead or behind the other; provides best utilization of the supervisor's time; and reduces the possibility for carry-over of littered or missed streets. It also has reduced the cost by permitting us to eliminate several positions.

Tentative studies have been made in nearly every district and minor changes put into operation in most districts. It is anticipated that the entire West Philadelphia district, which was operated with both horse-drawn equipment and trailers, out of three different headquarters, will move to a consolidated headquarters in the new building described above by the end of 1955; and it should be possible to have a complete new routing in West Philadelphia by early 1956.

We know that citizen satisfaction has been improved, although the number of complaints has not fallen substantially. Since many public administrators consider complaints as an index of the quality of their operation, this may seem to be wishful thinking, but the increase in freely offered commendations sent to us or to the newspapers couldn't be generated without citizen approval.

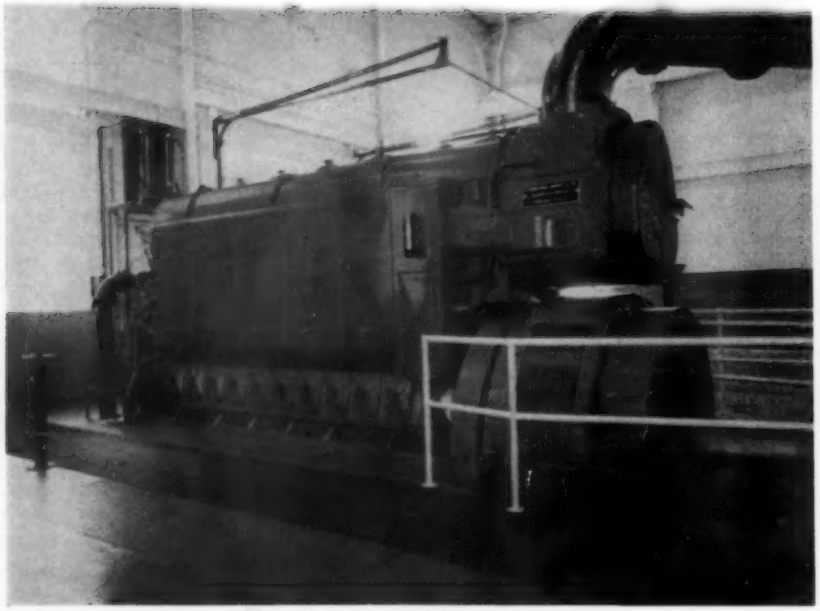
Our "Clean Sweep" program is cleaning areas which have not been cleaned thoroughly for many years, and many people call and ask us to use that system on their streets on every rubbish day, which is, of course, impracticable. One index of our effort might be that of the national "Cleanest Town" contest which Philadelphia has won for eight years in a row, largely because of the efforts of the Clean Up-Paint Up-Fix Up Committee of the Chamber of Commerce, but we feel that the tremendous improvement in the quality of our refuse collection system and our street cleaning operations in the past two years has played a part in these awards. We have had a surprising number of citizens call, write or speak to our employees and compliment us on the improved cleaning in their neighborhoods; or to comment favorably on collections in enclosed trucks or the elimination of horses. We have had complaints and newspaper criticism because we are not going all the way to supplant the farmers who are collecting garbage in open trucks (with canvas covers) by a nice, shiny, completely enclosed compactor.

One might be surprised when he sees a high morale in a large division which has gone through the trials of reduction in sick leave; substantial reduction in absenteeism; the abolishing of overtime except for unusual conditions; the taking of examinations by many provisional employees for appointment; and the loss of those who failed to pass the examination. But, behind all of this, there has been a steady increase in morale and the employees are able and willing to put on an extra burst of effort when it is needed to collect the rubbish on a double day (the week after a holiday) or to clean up the debris after Philadelphia's first hurricane.

Even the truck drivers are doing a good job of cleaning their trucks with no assistance, but our collection fleet will be even cleaner when our first truck washing equipment comes into operation next fall.

It has been possible through reorganization of our mechanical street sweeping equipment by consolidating it under one functional supervision to increase the curb miles swept monthly from about 500 miles in 1954 to 3700 to 4000 curb miles in 1955. Satisfaction is also noted in an area of normal general dissatisfaction; that is, in our congested areas where many neighborhood groups have sprung up with assistance from the Chamber of Commerce, the Sanitation Police Squad assigned to the Sanitation Division, or from our own field people, to help clean their own areas by improved set-out of rubbish, to try to eliminate litter on their streets and walks and to provide cleaning far beyond that which any Street Department can give them.

If there is a lesson in all these words, it is merely this: That good employees with proper tools and facilities, plus good management can give the citizens of a large city a bargain for their sanitation dollar, and this has been done in Philadelphia.



● SIDE view of F-M 1400-hp diesel which is painted red to signify its "rescue" duty.

City Standby Diesel Plant meets Hydro Power Crisis

A 1600-hp. Fairbanks-Morse opposed-piston diesel engine helped carry the city of Plattsburg, N. Y., and surrounding area through a severe hydro-electric power crisis in the winter of 1953-54. Water supplies throughout the region had steadily dwindled, cutting production at four hydro stations on the nearby Saranac River and threatening the entire region with a partial blackout. To compensate for the loss in hydro power, the Plattsburg Municipal Lighting Department operated its 2100-kw. standby diesel plant on a 24-hour schedule and rushed installation work on the new 1600-hp. diesel engine. By November 16, 1953, far ahead of schedule, the plant had succeeded in putting the new engine on the line and, with standby power alone, was in position to meet its full residential and part of its commercial demand. This freed sorely needed hydro power for use in surrounding communities and helped mitigate the effects of the power shortage throughout the area.

Driving an 1136-kw. alternator, the new Fairbanks-Morse engine has raised the generating capacity of the Plattsburg standby plant to 3236 kw., sufficient to carry 40 percent of the city's normal demand in times of emergency. Until it was installed, the plant's three 1000-hp. Fulton diesels, part of the original equipment, could carry only 26 percent of the demand, less than the normal residential load alone.

To emphasize the emergency status of the new unit, plant officials have given it a coat of bright fire-engine red paint, adding greatly to the attractiveness of the plant's interior and making it one of the most "colorful", if not one of the "best-dressed", diesel engines ever installed anywhere.

The new engine has been operating at unusually high efficiencies for a standby engine. According to Stanley W. Niles, Business Manager of the Municipal Lighting Department, and Walter W. Gottburg, Plant Superintendent, the engine has been delivering power at the rate of 14 kw. hrs. per gallon of fuel oil, despite intermittent service. Housed in a 34-foot by 65-foot wing, recently added to the plant building, it can be placed on the line at full load in two minutes and it has become the plant's base load unit.

Plattsburg's Municipal Lighting Department, which in 1953 distributed a total of 42,720,810 kw. hrs. among 5,079 connected customers, including 4,793,400 kw. hrs. generated with its own facilities and 37,927,410 kw. hrs. purchased, decided in favor of adding a new engine when in 1952 its standby capacity fell below the city's normal residential load. Familiar with the periodic occurrence of water shortages in this section of the state, the department called in Burns and McDonnell, consulting engineers, to prepare a survey of the city's power needs. As a result of this survey, bids were subsequently let and construction begun in the spring of 1953 on a new addition to the plant building. Space for a total of three new engines was provided.

An important consideration in the selection of the engine was economy. The Plattsburg plant, though a standby, had in the past produced as much as 6,000,000 kw. hrs. in a single 12-month period and as a result had always stressed heavy-duty operation and high efficiency in the design and selection of its equipment. In its first 13 years of service, from 1941 to 1954, the department returned almost $330,000 to the city in the form of free municipal electricity and saw its fixed assets rise from $729,892 in 1941 to $1,595,959 as of December 31, 1953. An example of its sound financial condition is the manner in which it paid for the recent expansion program. The full cost of the new engine, including the construction of the new wing, basement, and auxiliaries, was paid for in cash from the department's construction

(*Continued on page* 184)

New Methods

Ease Florida Road Cost Problem

C. A. PETERSON, Formerly Director of Public Works, Pinellas Co., Fla.

WE ARE BUILDING 20 percent more roadways, without increasing our budget, by using local materials in new combinations. We do not have our road problems whipped, but we do have them slightly groggy.

Our fight for cheaper materials was not of our own seeking. It was a fight forced upon us by two inflexible factors: increasing demands for new roads, repair and rebuilding; and increasing freight rates that threatened virtually to cut in half our road building budget. For example: High quality road materials must be shipped to us from points varying from 100 to 700 miles away. Slag fob the plant is priced at $1.45 plus $3.15 freight; crushed stone costs $2.45 plus $1.14 freight; and crushed lime-rock is $1.00 plus $1.10 freight. These prices are in the car, so the cost of unloading and trucking to the job must be added.

Our needs are expanding twice as fast as our budget. In figures, our county population rose from 130,000 following World War II to 210,000 in 1955 (estimated). The six-county West Coast area, by official census figures, jumped 45 percent from 1930 to 1950, while the nation trailed with only 14.5 percent.

Add to this population problem a seasonal traffic count of roughly 500,000 tourists and remember that

● LAYING marl on Pinellas County roads with a Wood Mixer.

(Editor's Note: *The author is a pioneer in adapting local materials to local roads. His experimentation and research over five years has resulted in interesting conclusions. Mr. Peterson conducted his work as Director of Public Works for Pinellas County, Florida, a post which he resigned as of June 1, 1955.*)

the state primary roads are useful mainly to get people to the area, but provide only limited utility once these tourists have arrived. Our problem, then, is not in arterial throughways, as such, but in permitting free traffic circulation to points of interest. No small complication arises from the fact that so many who come decide to stay, hence we have hitherto virgin areas suddenly becoming subdivisions, with more demands for modern access roads.

Our search for local materials was intensified by our geography. We are a peninsula, 38 miles long and roughly 14 miles wide at the widest point, which makes for a relatively simple grid pattern of roads, except that flanking the coast there is a chain of densely populated islands, or beaches, the focal point of tourist interest which must be mainland connected by causeways and bridges. Also as a peninsula, our freight is all one-way; there are few return loads for empty gondola cars and this adds up to higher prices.

The grid system is relatively simple—on a map, that is. Actually, it involves cutting new roadways where there was none before or facing a difficult right-of-way problem where buildings have bottlenecked yesterday's inadequate road ways.

It adds up to a $33,000,000 price tag to bring county and state roadways up to standard in the next twenty years. Right now sufficiency ratings on the state roads, measuring 89 miles, show 35.6 percent good, 34.3 poor, and 30.1 critical. When our road program started four years ago 90 percent of our 412 miles of County maintained roads were substandard with 162 miles then unimproved. Of the 250 miles of improved roads, we have widened, retreaded and resurfaced 66 miles, counting some entirely new construction in the total. The old roads, some designated as far back as 1912, still pose a 162-mile work load. Those 66 miles add up to 828,000 square yards of pavement, built on an average yearly budget of approximately $240,000. So much for the Pinellas problem; the solution is not quite so easy.

Our first decision had to be on types of construction based on sufficiency ratings. Types of construction, in view of the problems already stated, inevitably led us to experimentation with local materials. Available materials were not encouraging. Sand loam, found in abundance, is a sharp sand with a fine content of 3 percent to 5 percent passing the #200 sieve, and bearing value 18 to 22 pounds per square inch. Also available is "sugar" sand (virtually impossible to hold); very fine, dry yellow sand; beach sand; marl; fresh water shell and oyster shell. Our road specifications

● MOTO-paver is laying an emulsified asphalt surfacing on a main road.

call for 40 pounds bearing per square inch, so obviously sand required additives. Marl, with heavy silt content, could not stand a Florida rainy season and bear the load. However, the combination of the two materials, at about 30 percent marl, has proved economical and wholly satisfactory for urgency roads designed for stage construction, when waterproofed with emulsified asphalt. The waterproofing is essential, since much of our topography is low. We have an ever-existing drainage problem with high water tables, as well as surface water, to contend with.

Our second experiment was with sand and fresh water shell in the same proportions. Here again asphalt is essential, not for waterproofing, but as a sand-shell binder.

The third formula was a straight marl-asphalt mix, used in 6 to 8-inch thickness according to conditions.

The fourth plan was a straight marl base, useful only in higher well-drained areas with a low water table. Higher cost roads were conventionally constructed of crushed limestone.

Current experiments, with results not yet in, are being conducted on a mixture of 25 percent to 35 percent limerock to 75 percent to 65 percent sand loam. It is still to be determined whether an asphalt additive will be needed. If this can be deleted we will have eliminated another high freight cost ingredient.

Preliminary tests indicate this may prove a valuable addition toward better roads, but the final answer depends, as do all our experimental programs, on the recommendation of our testing laboratories. Limerock, although an import, is little more expensive in our area than marl trucked longer distances; hence it may eventually become competitive for lower cost construction. Our laboratory reports indicate that the key to successful construction with any or all of these various types of road base lies in close control of the in-place mix.

On the basis of continual checks of all these types of roads we have reached the conclusion that all are satisfactory providing they are properly surveyed and engineered; providing also that curing characteristics are closely watched, and not rushed, weather conditions are taken into calculation, and on-site mixing is closely controlled.

The aggregate may be prepared either manually or as a plant mix. Manually, the aggregate proportions are mixed with emulsified asphalt applied uniformly at the rate of 5 gallons per square yard, or as directed by the engineer, until the specified amount has been applied. Specifications on amounts needed come from the testing laboratories. The actual mix is made with blade grader, harrow or Seaman Pulvi-Mixer.

● **EMULSIFIED asphalt surfacing on Lealman Ave., St. Petersburg, was laid with a Moto-Paver.**

With plant-mix, we used a Woods Mixer with emulsified asphalt being handled through the pug mill. The mixture was allowed to cure until it had reached the proper consistency for compacting. The mix was then aerated with a Seaman Pulvi-Mixer and laid out in 2-inch layers. The first layer was compacted with a pneumatic tired roller, with the operation being repeated until the required pavement thickness was obtained.

In essence, the same method was used in oyster shell-sand base roads as in the sand-marl type just described. After placing, the bases were primed ready for the wearing course of bituminous material, either mixed-in-place with limestone or slag, or machine laid, depending upon the equipment available.

We are now using a Hetherington Berner Moto-Paver, using 1 cubic foot loose measurement of grade #13 stone mixed with from 0.6 to 0.8 gallon of emulsified asphalt per square yard per inch of thickness. We follow with a mineral seal coat of 0.15 cubic foot of grade #18 stone shot with approximately 0.2 gallon of emulsified asphalt per square yard.

We have also used double surface treatment on prepared bases, using approximately 0.6 gallon emulsified asphalt, (quick setting), applied in two shots. The first used 0.25 gallon per square yard with grade #11 slag and the second 0.35 gallon with grade #15 slag. The proportion of coarse to fine material was approximately two to one.

We feel that using local materials has not lowered the standard of our construction, and that the 20 percent savings earned by our experimentation have been fully justified in a tangible result—more roads.

Our savings figures are reached by a comparison of unit costs as shown in Table 1. These unit costs speak for themselves probably loudest to the overburdened taxpayer who knows nothing of road building, but who squeals at tax time when he gets his bill, but squeals even louder if he can't get where he wants to go quickly and easily—and above all comfortably.

Table 1 — Unit Costs

Sand-Asphalt	**$1.15**	**per**	**sq.**	**yd.**
Sand-Shell Asphalt	**1.15**	**"**	**"**	**"**
Marl Asphalt	**1.20**	**"**	**"**	**"**
Marl Surface Treated	**1.25**	**"**	**"**	**"**
Oyster Shell Surface Treated	**1.35**	**"**	**"**	**"**
Single Surface Treated	**.30**	**"**	**"**	**"**
Double Surface Treated	**.35**	**"**	**"**	**"**
¾" Machine Retread	**.26**	**"**	**"**	**"**
1" Machine Retread	**.37**	**"**	**"**	**"**

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Waterborne Disease Outbreaks

In 1954, only four outbreaks were reported to the Public Health Service in which there was good evidence that water was the vehicle of infection. There were also three other outbreaks in which water was suspected as the source of infection. Of the seven, 2 were in New York; 1 in W. Va.; 1 in Kentucky; 1 in Tennessee; and 2 in California.

One of the four waterborne outbreaks was typhoid fever in a coal mining village where water was pumped from a worked-out section of a mine into the distributing system of the town. Two outbreaks of gastroenteritis were reported. One was explosive and followed contamination of the water supply after heavy rains; the other occurred in a recreational area where untreated well water was used.

Other outbreaks suspected of being waterborne included three of gastroenteritis following consumption of water of doubtful sanitary quality. Single cases of typhoid fever were also reported in which it was found that infection followed the use of water from wells. Thirteen cases of gastroenteritis were reported among members of a basketball team who drank water from a school well which, on examination, was found to be polluted. Details in Public Health Reports, June, 1955.

SPECIAL TRUCK BODIES —SPEED— WATER DEPARTMENT WORK

WATER departments all over the country are finding that special truck bodies, designed specially to meet water maintenance and repair work requirements are advantageous. In response to a questionnaire from the editors of *Public Works,* 174 cities described the equipment they are using. Many of these special bodies are manufactured by firms specializing in this work; others are from the designs of the local superintendent. Some of the descriptions are given below.

We have a Dodge truck with a special body, built in our own shop. This truck is used for general maintenance and repairs and is equipped with all tools and materials necessary for this type of work, including a two-way radio set.—*L. G. Fabing,* Superintendent of Water, Lompoc, Calif.

Some shop built trucks and pick-up bodies are in use but two new ones were purchased this past year. A Powers body was mounted on a ½-ton pick-up for meter repair and service and a Lambert body was mounted on a 1-ton dual-wheel pick-up for service installation crew.—*C. E. Sturdevant,* Superintendent, Water Department, Orange, Calif.

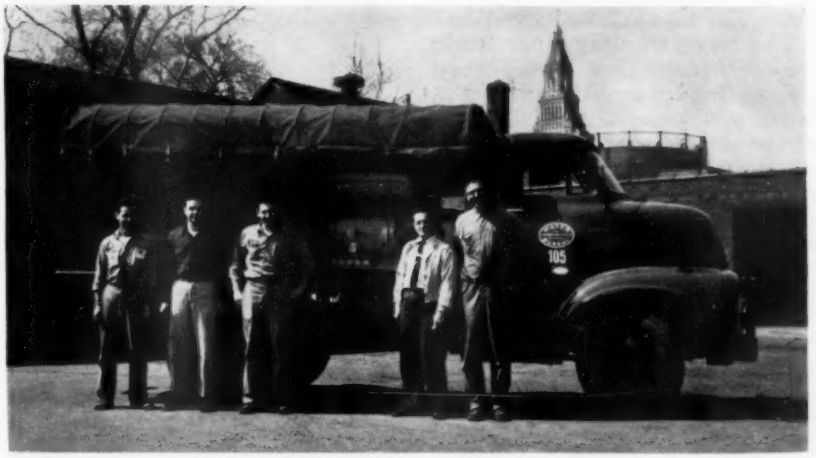
We have 8 trucks with special built fitting boxes to expedite our work.—*William R. Seeger,* General Manager, Marin Municipal Water District, San Rafael, Calif.

A special body 1-ton utility truck, with a body designed by us carries all small tools and can haul trailer-mounted supplementary equipment. —*Bernard Westkamper,* City Engineer, Public Utilities, Tulare, Calif.

We have a 2-ton truck, special body, carrying an air compressor. —*M. Van Bradt,* City Superintendent, Fort Morgan, Colo.

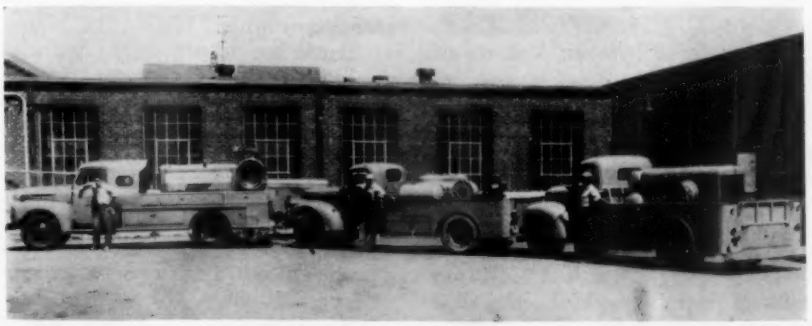
We have 16 special service crew trucks complete with air compressors, tools, and seats for the men, all enclosed in a specially built van type body. *Warren A. Gentner,* Chief Engineer, Hartford, Conn.

We have three 2½-ton trucks with compressors mounted on them. All three trucks were designed by this Department. One truck is used by our Service Dept. and has the necessary compartments to meet their needs. The body and shelter for the service crew was built for us at a cost of $1,000. The other two trucks were built by our Automotive Division at a very low cost to us. They are used for water main repair and extensions of water mains. They have the necessary compartments for their needs and carry a full complement of tools.—*Gordon A. Beckwith,* Superintendent of Water, New London, Conn.



● **WORK TRUCK of Hartford Co., Conn., Metropolitan District Water Department carries a 150-ft. air compressor and provides room for needed men and equipment.**

Our trucks include: (1) A flat-bed dump body on a 1½-ton Chevrolet chassis, with removable shelter for men, tool box and side boards or stakes. Heavy tool boxes are mounted under the bed to clear dumping operations. Demountable "A" frame is proposed for rear attachment. It is a very versatile truck and can be used to haul pipe, dirt, rock, etc., and carry tools, equipment and crew. It is used in main and hydrant installation, maintenance and all heavy work; it operates with a normal crew of foreman and six men. (2) "Walk-in" delivery type body on Chevrolet 1½-ton chassis. It has some racks and retainers for long tools, coils of copper, etc. Small tools and fit-



● **TRUCKS operated by the New London, Conn., Water Department. One truck is for the Service Department; the other two are used in water main extension work.**

tings are carried in individual tool boxes. It is used in service and meter setting installation and maintenance, also main breaks and other lighter work. It operates with a normal crew of foreman and eight to fourteen men. (3) Two standard Chevrolet ½-ton pick-ups with removable tool box in front end of bed; used for turn-on and off, meter operation and maintenance "trouble shooting," etc. They operate normally with two men each.—*Robert H. Meeker,* Superintendent, Dist., Belleville, Ill.

The boxes we use on our trucks I made myself. They have bins for pumps, generator, valve wrenches, boots, meters and all small fittings—almost anything we need we carry all the time. There is a place to mount lights when we work at night.—*F. Eldridge Corbit,* Superintendent, Dist., Carbondale, Ill.

We use Powers truck bodies on all trucks. The men who use them have stated that the use of these bodies have helped them organize their work in that they know where to go to find quickly the article they need in their work. *C. L. Baylor,* Village Engineer, Downers, Grove, Ill.

We have one dump truck, one 2-ton truck with chain hoist on back, one ¾-ton truck with special compartment type body and seven ½- and ¾-ton pick-up trucks.—*Louis Sersig,* Supervisor, Water Dist., Rock Island, Ill.

Our large trucks have pole line bodies and power take-off winches; small trucks have "Utility" bodies with side compartments.—*Harry Cress,* Superintendent, Water Construction Dep't., Fort Wayne, Ind.

We use Holan type bodies for leak and meter trucks.—*A. G. Giannini,* Superintendent, Hammond, Ind.

We have two trucks, one pick-up with bins for fittings, pipe vise, etc., which is used for meter installation. The other is a big truck with bins for tools, fittings, winch and pipe hoist. These trucks save time and also can carry the things needed on the job.—*Richard Coote,* Superintendent of Filtration, Valparaiso, Ind.

An "A" frame is mounted on a 1952 Ford ½-ton truck. This is used for handling Muller C-1 machine and for all kinds of maintenance on water lines, hydrants, etc.—*Erna R. Jones,* Superintendent, Distribution, West Des Moines, Iowa.

We recently purchased a ½-ton pick-up with standard McCabe-Powers service body.—*C. C. Thompson,* Superintendent of Water, Newton, Kansas.

We use McCabe-Powers utility beds on our trucks.—*Vernon Margheim,* Superintendent of Water, Russell, Kans.

We have a utility truck similar to those used by telephone and electric companies. It is mounted on a 2-ton Dodge chassis and has a sliding metal top, fitted with compartments and bins. We find it very useful as it is completely stocked for emergency or regular installation work.—*L. K. Parker,* Superintendent, Water Distribution, Auburn, Maine.

We use a special built body with side doors (4) each side. Height of compartments approximately 24 ins., width 16 ins., depth 10 ins. Some of these compartments (3) are divided with drawers and small bins approximately 8 ins. x 10 ins. x 5 ins.—*Louis F. Parent,* Manager, Water Distribution, Van Buren, Maine.

● **UTILITY truck of Auburn, Me., Water Dep't., has special bins which are kept well stocked.**

In 1950 we purchased a ¾-ton chassis on which we placed a special body with compartments on each side for tools and parts, leaving the center part of the body clear for larger equipment such as pumps, etc. It has worked out very well, except for the fact that as in all cases of utility trucks, there is a tendency to overload the same.—*J. Elliott Hale,* Superintendent, Water Distribution, Waterville, Maine.

Truck bodies are rigged with an aisle through the center and storage bins along the inside of the body at either side. Height of bins is designed to permit use as seats for personnel. Hooks, for carrying service pipe, gallon kegs, and long material are attached at sides. There is a bell signal from back to front for safety.—*B. L. Werner,* Engineer, Water, Baltimore, Md.

We have two emergency trucks equipped with enclosed cabins for the crew, bins for gate and hydrant wrenches and picks and shovels, also with automatic gate closers. Our plumbers' trucks are equipped with bins for the storage of all types of plumbing fixtures and necessary tools. We also have a special meter truck equipped with racks to carry a varied assortment of meters from a ⅝-in. to a 4-in. meter.—*D. M. Sullivan,* Deputy Commissioner, Boston, Mass.

We have standardized on Powers utility truck bodies, for service pipe, meter, hydrant and main line work, ¾, ½, and 1¼-ton.—*K. Raline,* Superintendent, Water Department, Brookline, Mass.

Trucks: One ¾-ton with compartments for plumber; one ½-ton with compartments for meter truck.—*Matthew D. Sullivan,* Superintendent, Fall River, Mass.

We have a ¾-ton utility body by Kiley of Somerville, Mass.—*Ralph E. Preble, Jr.,* Manager, Water Department, Ipswich, Mass.

We design our own compartments for our emergency and construction trucks. The emergency truck is on a ¾-ton chassis and is equipped with two-way radio, alternator, flood lights and compartments for emergency tools. Construction truck is a 3-ton truck with two-way radio, flood lights off of transformer, compartments to hold all tools necessary for construction and maintenance.—*Harry P. Loftus,* Superintendent of Water, Marlborough, Mass.

Powers service master bodies on ¾-ton trucks.—*Chester R. Spielvogel,* Superintendent, Southbridge, Water Supply Co., Southbridge, Mass.

The trucks used by the Water Department are equipped with a utility body with built-in bins and compartments. A canvas top goes over the entire body.—*James Williams,* Superintendent, Public Works, Stoughton, Mass.

We are at the present time using a 1½-ton Dodge, 1948, with a large step and milk delivery body which we feel is highly inadequate. We, no doubt, will replace this truck in

● **EMERGENCY valve operating truck used by Baltimore, Md.**

● **MORRISON body used at Laconia, N. H., is mounted on a half-ton Chevrolet truck. There are three compartments on each side and ladder rack mounted on top.**

1955 with a utility body manufactured by McCabe-Powers or equal. *Norman A. Koerwitz,* Manager of Public Works, Niles, Mich.

Two of our trucks have steel tool boxes and compartments built-in on both sides of the truck. In these compartments are kept small tools, water service materials, and road torches.—*Herbert G. Parker,* Civil Engineer, Royal Oak, Mich.

We have a one-ton truck with side tool racks and compartments on a pick-up body. We also use a tool trailer for construction and/or repairs of mains. The sewer maintenance vehicle tows a power sewer auger on trailer.—*Max L. Morris,* Superintendent, Public Works, South Haven, Mich.

Our service trucks are designed by our own department personnel and include compartments for special tools; also a weatherproof compartment for the personnel to ride in the rear of the truck which is curtained and can be drawn to protect the men from the weather.—*Leo Keefe,* Engineer, Public Health, Duluth, Minn.

The City of St. Cloud, Minn., is going through a period of change right now and we hope soon to be able to arrange for some of the more convenient methods of carrying on our business, such as having two-way radios in the new trucks we hope to get, as well as a radio contact with the Fire Dept. of this city.—*Fred G. Thielaman,* Superintendent of Water, St. Cloud, Minn.

We use ¾ ton pick-up trucks with the Powers #44—90 body.—*Ira M. Vraalstad,* Superintendent, Water Department, St. Louis Park, Minn.

Our truck body is similar to a telephone service truck body.—*H. B. West,* Superintendent, Water Department, Grenada, Miss.

Water service trucks are Ford ½-ton pick-up with side-mounted bins and pipe vise, cutting and threading tools. Trucks have overhead racks installed for pipes.—*E. P. Lowe,* City Engineer, Oxford, Miss.

We have one ½-ton Chevrolet truck with a Morrison utility body, and the body has three compartments on each side and ladder rack on top. Our fitting bin is equipped with compartments for a variety of fittings. This body has a pipe vise and socket to receive it and a pipe rack. We find it very convenient and practical.—*Theodore L. Cate,* Superintendent, Laconia, N. H.

Two trucks have air compressors mounted crosswise in the body which is divided into compartments for tools and material. Our truck has winch for pulley or lifting. Meter trucks have radio and special body for tools and material—*Harold Florence,* Superintendent, Ridgewood, N. J.

We have ¾-ton and 1-ton pick-up trucks for maintenance use. All trucks are equipped with service boxes mounted on the sides (Stahl). These boxes will hold small tools and all necessary repair equipment for service line work. We manufacture our own metal roof frames that completely cover the pick-up body and side boxes. In the pick-up body we build racks for various types of gate wrenches and hand tools. In the 1-ton trucks we have four speed transmission with power take-off operating a Payne-Dean gate operator. We have red blinker lights mounted on the roofs of the truck bodies.—*G. G. Tripp, Jr.,* Sup't., Glens Falls, N. Y.

The New York City Department of Water Supply, Gas and Electricity operates: 13 ½-ton panel body trucks for light hauling for deliveries of lamp bulbs, tapping mains and other light mechanical work; 80 ½-ton pick-up trucks for investigators, hydrant repair crews, etc.; 103 2-ton express body trucks, for transporting water main repair crews and miscellaneous work. A number of the trucks are equipped with valve operating devices and elevating tail gates; we have 27 2-ton trucks with compressors for excavating work, etc.; 29 2-ton dump trucks for miscellaneous work; 13 5-ton platform trucks, of which 11 are equipped with a boom for heavy hauling; and 2 10-ton crane trucks equipped with a bucket, etc., for large excavations and miscellaneous heavy work.—*Arthur C. Ford,* Commissioner, New York City, N. Y.

Our Water Department trucks are equipped with Morrison bodies.

● **DOORS on this truck at Pleasantville, N. Y., open flat to provide a convenient working surface for crew.**

—*George H. Straub,* Superintendent, Mamaroneck, Harrison, Larchmont, N. Y.

Our water service truck is a Baker-Raulang 120-in., with street lamp service steel body, adapted to our specifications for use as a water service truck; it is mounted on a ¾-ton Studebaker chassis.—*Leland A. Welker,* Superintendent, Penn Yan, N. Y.

Our special Water Dept. utility truck is ¾-ton, Hercules-Campbell, model B-910 or equivalent; all welded steel body with sliding metal roof; side compartments with horizontal doors that open flat to provide a working surface; and bins in side compartments for tools and fittings.—*J. D. Bailey,* Superintendent, Public Works, Pleasantville, N. Y.

We have one ½-ton and one ¾-ton truck, each with Powers utility body, with compartments, trays, etc.—*Elroy F. Spitzer,* City Engineer, South Milwaukee, Wisc.

Propane CUTS COSTS on Street Work

CHICAGO's Department of Streets and Sanitation has saved well over $30,000 a year by operating part of its maintenance fleet on propane (LPG) gas. Involved in the changeover were 16 Littleford tool heaters with 50-gallon tar tanks, and 18 Huber road rollers. A. W. Konefes, Superintendent of Equipment, breaks the savings down like this:

On the tool heaters, the propane gas burners last at least an entire working season (normally, 45 weeks). Actually, none of the burner units has had to be replaced in the two years they have been operating on propane. The saving on normal replacements amounts to about $130 per tool heater per season, or about $2,300 for all 16 units.

The kerosene burner units had to be cleaned every few weeks; and three tool heaters had to be kept in the shop for emergencies. Every time a breakdown occurred, department personnel spent at least an hour getting the new units out to the work site. Cost of cleaning and replacement of units in the field came to about $400 a month. This expense was eliminated by the switch to propane.

● **PROPANE tanks on this tool heater are mounted inside a special compartment. Changeover to propane has cut fuel costs and reduced maintenance and repair.**

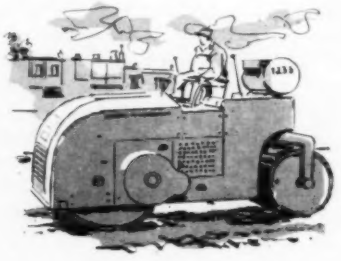
Cost of the two fuels is the same —12 cents a gallon, but consumption of propane is about eight gallons per day less for each unit than with kerosene, mainly because less is wasted in fueling. This item reduces fuel costs about $225 per season per unit, or $3,600 for the 16 tool heaters.

Two detachable 11-gallon propane tanks are mounted on each tool heater. They hold enough for one day of normal operation. An outside supplier delivers propane to a 1,000-gallon propane storage tank located at the Street Department's shops on Chicago's south side; this tank dispenses fuel to the 11-gallon containers. A shop truck carries the filled containers to each tool carrier in the field.

Street crews report that lighting the heaters is much simpler and faster than formerly. With kerosene, it was necessary to ignite a piece of waste cloth under the burner, and wait until the metal was hot. The propane-fueled burners are ignited immediately with a match, in much the same way that the burner in a gas stove is lit.

Cost of changing over the tool heaters came to $288; new burner units had to be installed, at a cost of $18 per set. The 1,000-gallon propane supply tank, together with auxiliary pump and tubing, represented an investment of $1,000. The 32 small fuel tanks required for the tool heaters, plus 16 which are kept in reserve, cost $1,000. In other words, an investment of roughly $2,300 produced savings of at least $6,300 per year.

Biggest dividend produced by the conversion of the road rollers is in



maintenance costs. Formerly, each unit required a major overhaul at the end of every season. Cost of this job was about $900. Operating on propane, the units will run at least two seasons between major overhauls, perhaps three, Konefes reports.

At the end of last season, the engine of the first converted unit was torn down to check on the condition of the parts. "I ran my hand over the piston surfaces and it came away clean," Mr. Konefes states. "There was practically no carbon buildup on the valves, and the oil wasn't anywhere near as dirty as it used to be with gasoline."

Engine oil is now changed every three months. Formerly, it had to be replaced every two weeks. Oil filters last an entire season. The life of spark plugs has been doubled.

The 78-octane gasoline formerly used to operate the rollers was priced at 12.25 cents a gallon. Pro-

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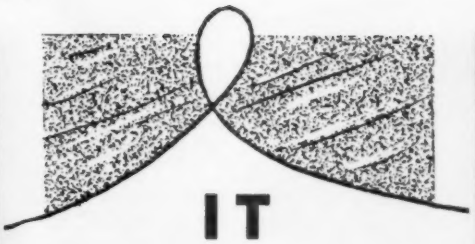

IT TAKES COORDINATION TO LICK SNOW

E. S. WARD,
County Engineer,
Kandiyohi Co., Minn.

ASKING a Minnesota County Highway Engineer what he does to prepare for the winter season reminds me of the old Swede story. A Swede on returning home from a visit to America was asked how he liked Minnesota summers and replied: "Well I couldn't say; I was in Minnesota only eleven months and that was during the winter." I would say that eleven months of a Minnesota County Highway Engineer's year is taken up with the actual winter period operations and preparing his roads, plant and equipment to meet the winter challenge.

Kandiyohi County is an average Minnesota County. It is an agricultural county in west central Minnesota, 24 townships and 864 square miles in area; with a population of 30,000 and a yearly road and bridge budget averaging $600,000. Willmar, the county seat, is a city of 10,000 population. In Kandiyohi County there are 1420 miles of highways; 150 miles of Trunk Highways constructed and maintained by the state; 720 miles by the County; and 550 by the Townships. However, several of the Townships hire the County to maintain their roads, so that in reality the County maintains about 1050 miles.

We do not have such a great annual snow fall but the wind has a habit of blowing the snow around so much that before spring we have handled the same snow several times. In fact, some of our men contend that they recognize various drifts as ones they have plowed previously in other locations. Each time the wind moves this snow it mixes in a little dust or dirt and the resulting mixture becomes very heavy and hard to handle. Often, after a wind storm, the snow is so compacted it is difficult to get the plows started into the drifts, the point of the plow having a tendency to slip up over them.

A few years ago people expected to be snow bound for a week or two at a time and they were prepared for that condition. Now even our farmers do not carry a large supply of food in winter. They buy their bread, butter, and milk in small quantities at the grocery store, the same as their city cousins. Bulk milk must go to town nearly every day. School children are picked up by bus and delivered to the consolidated school, usually in town, by 8:30 each school day. Rural mail is carried daily on nearly every mile of rural highway; and many people live in the country and travel back and forth to town to work. The result of all these activities is a steadily increasing demand for more and earlier plowing of our roads. To meet this demand the crews must start earlier. as soon as visibility permits after the storm which often starts in the middle of the night or early hours of the morning.

To eliminate loss of valuable time in notifying the operators and getting the plows started away from headquarters is an important item and is easier said than done. It is the result of considerable planning and attention to many details and this planning includes the proper arrangement and housing of the administrative and supervisory personnel, as well as that of the equipment. It is only by the full co-ordination of a county Highway organization that you can win in a battle with the elements.

In 1942, Kandiyohi County Highway Department moved into a new and quite modern building, housing not only the shop and equipment but also the office, engineering and supervisory activities. In 1952, we built a combination warehouse and storage building. Both of these buildings face south and are in the same block, the front of the new

● **DOOR of shop is of ample size to accommodate this 10-ton Oshkosh truck with its mounted snow plow.**

building facing the back of the old building and the remainder of the block between being used for yard. There are flood lights on the top of the new building and there are lights on the old building also. When these are turned on they light up the yard and make it convenient for getting around and getting started, even at night.

In the new building, each truck has a stall large enough to accommodate it with a plow and wing attached all ready to go. The building is heated with gas and is thermostatically controlled from +25 up. We keep the building cool to minimize the temperature differential when the equipment goes out.

● **IN THE new building there are stalls large enough to accommodate each of the trucks with snow plow and wings attached, ready to start plowing out big drifts.**

The shop is in the old building and is equipped with hot and cold running water. When a truck comes in covered with ice and snow it is run into the shop, washed and serviced after which it is checked over by a mechanic and returned to its stall in the new building ready for the next trip; all the operator needs do is to step on the starter and go. The door is large enough to accommodate our largest truck, a 10-ton Oshkosh, with plenty of room.

The administrative and the superintendent's office is equipped with a two-way radio station. All the county's snow fighting equipment and the supervisory cars are also equipped with two-way radios. The supervisor pictured at his desk in the business office is answering the radio. The telephone style transmitter-receiver he is holding, when not in use, hangs on the end of the desk in easy reach. It is no more bother to answer than the telephone setting on the desk.

The superintendent's office is next to the shop and he is talking to some of the equipment operators. The superintendent's secretary is in charge of all parts, stock supplies, equipment rentals and operators' time. Probably you considered this a man's job but we have found girls very capable and having a couple around has a tendency to keep the place so that our women taxpayers will not hesitate to pay us a visit.

The radio system certainly is a convenience. We have had one since the spring of 1942 and have come to look upon it as a necessity. It is our intercommunicating system. By it we are enabled to keep track of our operations and service any of our equipment when they are in difficulty or give them instructions when they are in doubt; but far and beyond that is the public service it allows us to give. It is a rural area insurance against being snow-bound in cases of emergency such as accidents, sickness or death. We advertise this service and solicit the business. We can, under normal winter conditions, in case of emergency reach any part of the county in about 30 minutes and many times due to having a plow in the vicinity and the means of communicating with it we can be there in a much shorter time. This service is appreciated by the public and is seldom abused.

After a storm when the plows are out, the radios keep the office informed of road and traveling conditions; which roads are open; which are not; and visibility. The office, in turn, feeds this out to the public over the telephone, local radio station and the newspapers.

We are also equipped with weather watching equipment, including maximum and minimum thermometers, wind gauge, recording barometer, recording snow and rain gauge and a short wave radio for picking up weather bureau stations, allowing us to keep track of approaching storms. This information is also available to the public but is used mostly to keep our equipment informed of coming weather conditions; but we do notify school bus operators of approaching blizzard conditions.

The county owns two Snogo Rotary snow plows; one Walter five-ton truck; one FWD five-ton truck; one Ford F8; and two ten-ton Oshkosh trucks. All these trucks are equipped with interchangeable one-way and "V" snow plows. We rent two two-ton trucks and 8 power patrols which are also used for snow plowing operations.

Our shop is quite well equipped for the maintenance of our equipment and we carry a large stock of repair parts. We are seldom laid up for the want of needed parts and we attempt to keep our entire organization, as well as our equipment, in first class operating condition which is necessary to meet the impact of a Minnesota winter.

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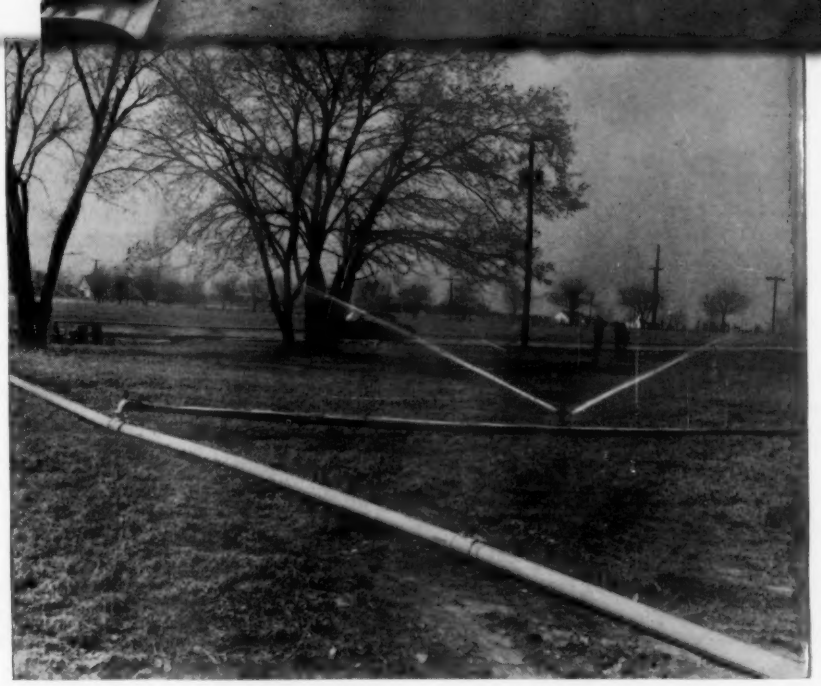
Those Water Shortages Mean Lots of Work

The U. S. Department of Commerce report on water shortages shows how far cities have fallen behind in needed provisions for supply. Of 552 cities recently surveyed, which serve some 80 million people, 21 percent have reserves of only 11 percent above the maximum day's demand; and another 21 percent have facilities which are judged "inadequate." In the past two years, more than 1,000 municipalities suffered water shortages. In all, only 58 percent of the nation's public water supply systems are deemed to be adequate. The cost for bringing up to standard the other 42 percent is estimated at $3.2 billion.



● **THIS is a view of the installation of the irrigation system at the Steele Canning Co. Note proximity of homes from which there have been no complaints regarding odor.**

SPRAY Irrigation for POULTRY and Canning Wastes

JAMES W. BELL

SPRAY irrigation of food processing wastes appears applicable to many such waste problems. This method has recently been adopted by two poultry processing plants and a cannery in Arkansas.

The Springdale Farms poultry dressing plant is located outside Springdale, Ark., in a heavily populated rural area. The city sewer line is approximately two miles distant and is thus unavailable. When the plant began operations, a septic tank and tile field were used for liquid waste disposal. As expansion took place this system became inadequate, and the wastes were lagooned. Though five lagoons were eventually built, complaints of odors persisted and an irrigation system was adopted.

All plant drains enter a 75-gal. concrete screening tank. An upright screen of four-mesh hardware cloth, midway of the length of the tank, fits snugly against the sides and bottom and extends above the flow line. After screening, the wastes pass into a 2,600-gal. holding tank, which provides about two hours storage. The waste is pumped from the holding tank by a 4-inch diaphragm pump and lifted 14 feet, to a point from which it flows by gravity to the center of the disposal field. Here is located an irrigation pump with a capacity of 125 gpm at 90-ft. head. From the holding tank to the center of the disposal field is 600 ft. From the pump, 400 feet of 4-inch and 300 feet of 3-inch aluminum lines distribute the water over the field.

Directly behind the plant the farm has a 20-acre tract of land set aside for waste disposal. The five lagoons, formerly used, occupy approximtately four acres of this area. The soil is a tight clay loam, not considered too good for absorption. About 16 ins. below the surface there is a clay hardpan which is broken by deep plowing. The field has been sown to permanent pasture in a mixture of orchard grass and ladena clover. In 1954 the hay crop yielded $2,000. The management estimates that the twenty acres, if not cut for hay, could easily pasture twenty head of cattle for eight months of the year.

From January to March the plant was applying 14,000 gallons of water daily over a 10-hour period at an application rate of about 0.25 inch per day on two acres. The peak application rate is during the summer months; normal daily summer production of 7,200 birds requires approximately 22,000 gallons of water. The dosing rate is then 0.4 inch per day on two acres. By using the entire 20 acres for irrigation, the annual application to the land for the entire waste product of the plant would be about 10 inches. The Hammond and Steel plants, discussed later, utilize a much heavier loading amounting to about 60 inches per year.

At present the sprays are not used, the wastes being discharged directly onto the ground. The soil readily absorbs the wastes, although the pipes have to be moved frequently. There are a few low areas in the field where slight odors are noticed from nearby, but no complaints have been received from the homes in the vicinity. The management intends to do some leveling to eliminate these low areas.

The Farm spent $1,000 for the irrigation pump, aluminum pipe and 20 spray jets. The screening and holding tank, the 4-inch diaphragm pump, and 600 feet of 4-inch pipe were already on hand. The cost of operation has been a small item. One of the plant workers spends an estimated 16 hours per week moving the laterals and the regular clean-up men clean the tanks and screen. Power for operating the pump is estimated at $60 per year.

● **CLOSE-UP view of a lateral and spray nozzle used at Lowell, Ark.**

The Hammond Poultry Processing Company is located near a drive-in theater and is in a densely populated area. Because of this, the plant has caused the management and the Health Department many headaches. City water is provided from nearby Fayetteville, Ark., but sewer facilities are not available. Initially, disposal was accomplished by a septic tank and sub-surface tile lines. As expansion began, the tile lines were unable to take care of the wastes, and a ditch was dug to a small creek from the end of the tile lines. The flow in this ditch was a chief source of complaints and led to development of the irrigation system.

Four small tanks which have flat stationary screens are used for solids removal. These screening tanks are 2 ft. wide, 3 ft. long and 4 ft. deep, arranged in series. The first two tanks have 10-mesh screens; the last two are 20-mesh. A fifth tank of the same size is utilized as a holding tank. Mounted on this fifth tank is a pump, which has a capacity of 125 gpm at 90 ft. head. Hammond uses 20 ft. sections of 3-inch aluminum pipe for both the feeders and lateral lines. At present 640 ft. of pipe are used.

Five acres of land are available for waste disposal. This area seems to be sufficient since only 3 acres have so far been needed. The soil is sandy loam, and has a relatively good absorption rate. By percolation test the soil absorbed one inch of water in five minutes.

The plant worked four days per week in January, and used an average of 15,700 gallons of water per day. Only one acre is used for disposal at any one time. The application rate is 0.58 inch per day. During peak production an average of 5,500 birds are dressed per day, using about 20,000 gallons of water. The application rate is then 0.7 inch per day. Using three acres for disposal the annual application is about 60 inches.

The entire irrigation disposal system cost $1800, including the cost of installing the five screening and holding tanks, the irrigation pump, 640 ft. of 3-inch aluminum pipe and 20 sprays. Operating cost has been a relatively minor item since one man spends an average of only ten hours per week moving and setting lines. The cost of operating the pump is estimated at $75 per year.

Odors have been eliminated and no complaints have been received in the two years of operation. The land is rolling, but no run-off or pooling has been noticed.

A Steele Canning Company plant is located in Lowell, Ark. There are a number of houses near the plant and the present disposal area. Prior to installation of the irrigation system, disposal was the source of many odor and fly breeding complaints. These complaints did not arise in the immediate area, for the wastes were discharged into a small creek after being lagooned and were carried away from the plant vicinity. The lagoons were not satisfactory, even after being supplemented by chemical treatment. As a last resort the company decided to try irrigation.

The entire system was installed new in early 1953, at a cost of $12,000. This included all concrete screening and holding tanks as well as irrigating equipment. For operation, one man is required full time. The other major item of operation cost is electricity for the pump and screening belt motors, which in 1954 amounted to $600.

Liquid wastes leave the plant by underground drain lines and enter the first screen house which contains a 4-mesh slowly moving screen belt mounted at a 30° angle with the horizontal. The wastes then flow to another screen house, similar to the first, with the exception of the conveyor screen which is 8-mesh. The waste leaves the second screen house by a tile line which empties into a 700-ft. open concrete ditch, terminating in a grit chamber. At this point a bypass has been constructed to shunt the liquid to a lagoon if a breakdown occurs in the irrigation system. Normal flow from the grit chamber is over a 20-mesh shaker type screen which is mounted in a holding tank 8 ft. wide, 10 ft. long, and 4 ft. deep. The flow continues into a final holding tank 10 ft. by 10 ft. by 20 ft. deep.

The irrigation pump is mounted on this final holding tank, the pumphouse enclosing both the tank and pump. The pump capacity is 500 gpm at 150-ft. head, using a 30-hp motor. The irrigation feeder lines are 4 to 6-inch; the laterals are all 4-inch. Rainbird 7/32-inch revolving spray heads are placed 60 ft. apart on the laterals. At this distance the sprays overlap slightly.

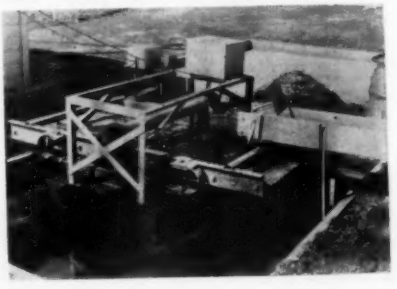
The Company is irrigating forty acres of rolling land. The soil is upland silt loam, and is suited for absorption of large quantities of water. The area is seeded to alfalfa, which has shown no ill effects from the large amounts of waste that have been applied. The average annual return from the hay over the past two years has been $5000.

The plant uses about 360,000 gallons of water per day in a normal ten-hour operation. Application over the forty acres is at the rate of about 0.33 inch per day. The management considers the present application to be as much as should be applied to the forty acres, though the soil could probably take more. With 180 days of operation per year, the annual application to the soil is 60 inches.

Conclusions—All three of these plants consider this method of disposal satisfactory and entirely suitable where a plant does not have access to a municipal sewerage system. Where land is available, the systems can easily be enlarged to take care of increased flows of waste due to plant expansion. Also, in every instance, some monetary return is realized from the irrigated land.

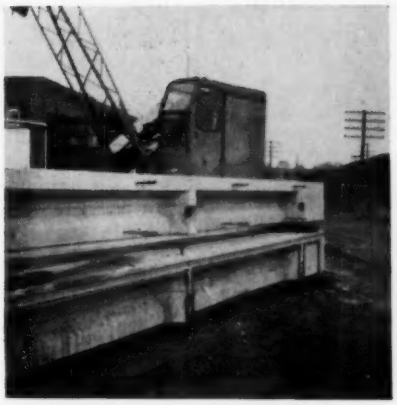
Water conservation is important and disposal by irrigation is one method of conserving waste water. It has been shown at Seabrook Farms in New Jersey that the water table may be raised by heavy spray application when deep penetration occurs. This is important in areas where the water table is dropping steadily each year. Irrigation thus offers a useful and economical method of waste disposal with the advantage of water conservation.

● **SIDE view of final screening of waste with vibrating screen, at Steele Canning Co., Lowell, Ark.**



PRECAST PRESTRESSED CONCRETE BRIDGES FOR A COUNTY

NORTH H. NEWTON, Champaign County Engineer, Urbana, Ohio

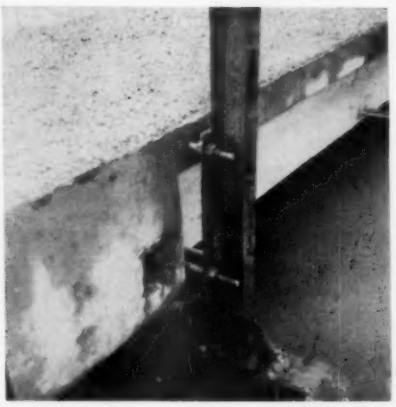


● **TOP** beam in stack is an outside beam. Note bolts for guard posts.

● **THIS** view of an abutment shows both the old part and the new portion.

● **OUTSIDE** beam is being set. No form work is necessary for roadway.

● **BEAM** is being placed in bridge. It is just about in its final position.



● **GUARD** rail post connection. A transverse rod can be seen near post.

● **FINISHING:** Guard rail and two posts, also transverse rod, are shown.

BRIDGES are falling down; they are deteriorating much faster than highway and street departments can replace them on limited budgets. Probably the greatest problem of highway administrators is the bridge situation. This is especially true of the secondary systems and the county systems.

Prestressed and precast concrete bridges are new in this area. The first prestressed precast concrete bridge in Ohio was built by Muskingum County at Roseville in the summer of 1952. This bridge was built of prestressed concrete beams with a concrete roadway surface poured on top of the beams after they were in place. The beams were cast on the site and moved to the bridge abutments.

From the time that the first accounts about prestressed and precast concrete bridges appeared in magazines I had a desire to try one. I collected design and construction material. After seeing the bridge job at Roseville my hopes were somewhat dampened. This was a big operation. It was not for small bridges. This was a good bridge; I do not mean to infer otherwise, but it was too large an operation for a county bridge crew. I gave up any thought of building a prestressed precast concrete bridge for the immediate future at that time.

I think that it was in 1953 that I heard about a plant that was casting concrete beams and shipping these to the bridge site. This interested me. The beams could be ordered to a certain length and for the desired design load. This type of casting made the prestressed precast bridge more suitable to county bridge work—and budgets.

After some review of our bridge situation a location was decided on to try our first prestressed precast concrete bridge. This was an old lattice rail truss of 20-foot span, designed for much lighter loads than we have today. It had not had the proper maintenance through the years; the steel was not very good but the abutments were good. They had been replaced in the early days of World War II, but materials could not be secured for a new superstructure at that time. Therefore, the old truss was set back on the new abutments.

Our new bridge was ordered in the early part of 1954. We specified an H-15 loading and a 24-foot road-

way. The beams were 17 inches thick, 3 feet wide and 23 feet long. There were two hollow tubes inside the concrete beams. This lightened the beams some, but they still weighed five tons each. The beams were shipped by rail to the nearest siding which was about three miles from the bridge site. Our half-yard crane lifted the beams from the railroad car to our low bed trailer on which we hauled four beams at a time.

We lifted the old steel bridge off of the abutments and then were ready to set the new concrete beams. This operation made it necessary to keep the road closed for only one and a half days. There was some finishing work to do and the beam type guard rail to put on. The traveling public was using the bridge and the road again after a day and a half detour.

This is a good bridge; it is as permanent as any bridge can be. It will be there a long time with a minimum of maintenance on it. It was quickly erected. No form work was necessary; there was no waiting time for the concrete deck to cure out. Again I say that this is a good bridge.

After reviewing this first bridge we had the urge to try a second one as soon as possible. We selected a location close to Urbana on a road that carries considerable truck traffic from a commercial gravel plant. Ready-mix concrete trucks use this route and trucks going to and from a dry ice plant cross the bridge. All of this traffic carries heavy loads. We used an H-20 loading for the new bridge.

The old bridge was a steel girder and beam structure, built long before anyone thought about the loads that we have today. It was of light design and it flexed a lot every time a load crossed it. The roadway was narrow. The existing abutments were of cut stone and were in good condition. We decided that it was worthwhile to salvage these abutments. We lengthened the abutments out on each end by pouring concrete walls. Nearly all of this concrete work was done before it was necessary to close the road. This lessened the time of inconvenience to the traveling public.

This bridge was a little different from our first one. The concrete beams were "T" shaped, two feet wide and two feet deep. Each end was square for a length of four feet; then the beam assumed the "T" shape. This square end gave good bearing on the abutments and it also made the beams stable during erection or placing on the abutment. There was no possibility of turning over during the placing operation. The "T" shape makes the beam a little lighter. This helps when you are handling these beams and the "T" section does not take anything away from the bridge as far as strength is concerned.

We had the beams shipped by rail to our yard in Urbana where we unloaded them with our own crane. In this way we were not rushed in handling the beams. The beams are not too hard to handle, but you must get ready for them and then take your time.

After the abutment work progressed close to completion it was necessary to remove the old bridge and close the road. The final pour of concrete was made. This was allowed to set seven days before setting the concrete beams on the abutments. The beams were set on November 29, 1954; this operation took six hours. We had to rent a crane to set the beams on the abutments as our crane did not have enough load capacity to handle them. The whole operation proceeded very smoothly and nicely. Our own crane loaded the beams in our yard onto our low bed trailer. We were able to haul four beams at a trip, and it was only a short trip from our yard to the bridge site. The 20-ton rented crane at the bridge site worked very nicely in handling the beams. The crane rental was a very small part of the expense of the bridge.

The concrete beams had holes for three transverse rods which are used to keep the beams together, preventing them from spreading or working apart under heavy traffic. The transverse rods were put in the second day and tightened up.

The two outside beams are cast with bolts in place for the guard rail posts. This makes it easy to put on a beam type guard rail. We fabricated our own posts for the rail.

As more engineers and contractors become familiar with it, this type of bridge will be used more and more. At the present time the manufacturing facilities are somewhat limited, but these are being expanded now, and will be expanded more in the future.

Some nearby counties have installed similar bridges with longer spans. Fred Lemcke, Greene County Engineer, has installed two bridges. His first bridge had a 40-foot span. The second bridge had a 54-foot span. Bernard Gebhart, Mercer County Engineer, has installed one with a 29-foot span. Henry McCrady, Pickaway County Engineer, has erected a 32-foot span bridge. Carl H. Bauer, Montgomery County Engineer, has completed a 37-foot span bridge. Several more are going through the paper processes which are necessary before construction can start.

We do not have accurate cost figures. However, the cost is not any higher than for other comparable construction. The maintenance on this type of bridge will be low. There is nothing to paint except the guard rail. The road is not closed for a long time. This reduces the inconvenience to the traveling public. I do not know how to figure this in money, but it is worth something and should be considered by every highway department.

It is my opinion that anyone considering a new bridge should give a lot of thought and consideration to the prestressed precast type of concrete bridge.

Cost of Constructing Water Mains in Toledo

Cost data on constructing 14,341 lin. ft. of 4-in., 6-in. and 8-in. water mains in Toledo, Ohio, for the fiscal year 1953, are shown in the annual report of George Van Dorp, Chief Engineer of the Water Department. On the basis of 6-inch pipe, lines less than 500 ft. in length averaged $6.40 per ft.; lines 500 to 1000 ft. in length averaged $5.25 per foot; and lines over 1000 ft. in length averaged $4.45 per ft. The total cost for all lines was $80,211.25; of this 49.5 percent was for materials; 24.7 percent for labor; 11.2 percent for equipment; 8.3 percent for supervision and overhead; and 6.3 percent for engineering.

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Limitations on Use of Water for Air Conditioning

A second installment of several hundred questionnaires received from Water Departments show that in 41 of 413 cities reporting, there are limitations on the use of water for air conditioners; 372 cities report no limitation. In replying, some cities enclosed copies of appropriate ordinances. One of the most complete was received from J. J. Meehan, Engineer of Water Works, Schenectady, N.Y. See also p. 156.

GROUND WATER
CAN ALLEVIATE SHORTAGES

KENNETH E. MOEHRL, Director of Research, Layne & Bowler, Inc.

The need for water will continue to increase, possibly at an accelerated pace. Certainly the demand will increase at a rate greater than the population. To meet the increased requirements without creating more problems, essentially requires intelligent development with more comprehensive planning.

MOST IMPORTANT in the selection of a water supply is its reliability, the quality of the water, and the economy of construction. Reliability is secured by the development of an inexhaustible source or by supplementing the existing supply and the use of permanent structures and equipment with duplication of those whereby the breakdown of a single unit might endanger the supply of water. There are two types of water shortages—basic, where the shortage is due to inadequacy of supply; and artificial, when the shortage is due to poor distribution or lack of storage.

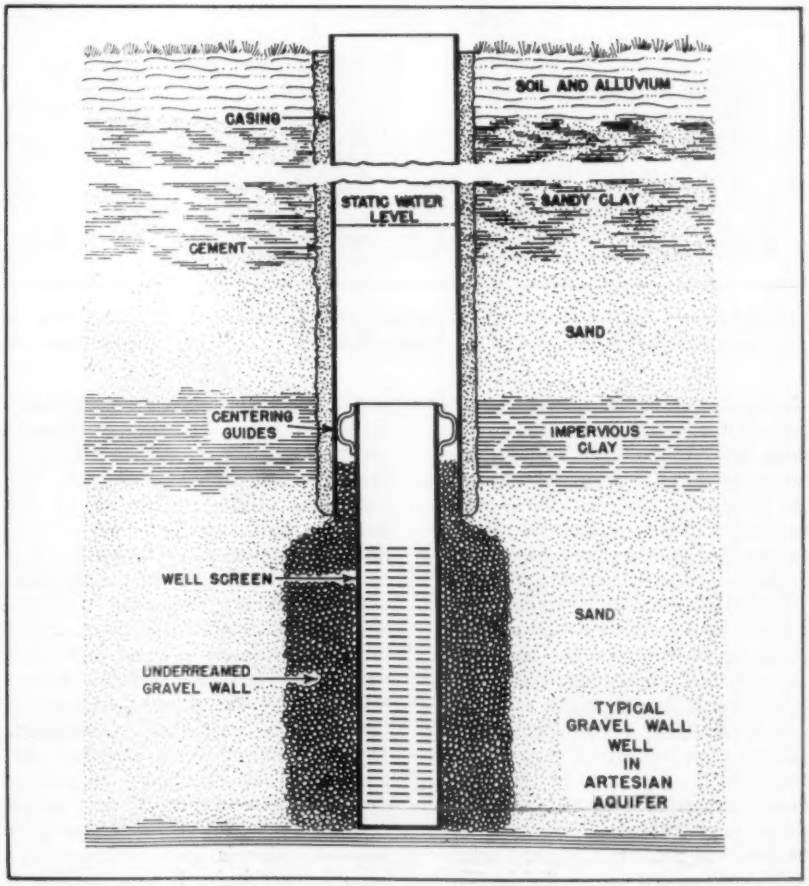
In either case, ground water may help: (a) by supplementing or reinforcing sources while a new or larger supply is being developed; (b) by providing spot or local supplies to reinforce over-loaded distribution systems, obviating the need for new larger lines; (c) by providing immediate relief—for wells may often be drilled more quickly than a new large reinforcing line can be constructed; (d) by relief low in cost, for under favorable conditions, this method may be much cheaper than any other.

Added advantages include: It may be possible to locate the wells very near the point of shortage; ground water may be available in areas where the water in streams has already been appropriated, or is contaminated; uniformity in quantity, since the yield from wells generally will fluctuate less than stream flow in wet and dry climatic cycles; and a supply more uniform in temperature and soluble mineral load than surface water.

In the selection of the well site, such factors as the sanitary hazards that might exist in the area, the geological conditions, the proximity of the area for economical reasons, and the possible future expansion of water supply should be considered. This cannot be done with the divining rod or any similar apparatus for which there is no scientific basis. An experienced and reliable engineer to study the possibilities of augmenting the supply with wells is of prime importance. If his work is to be successful, local engineering officials must familarize him with the details of the problem and must provide him with accurate data on water needs, areas, volumes, storage, pipe lines, contemplated expansion, etc.

If a satisfactory water supply is available in an area, a geological study is the most practical means of locating it. This may be in cooperation with the state Geological Survey, the State Board of Health, the U. S. Geological Survey, and a competent well contractor.

Haphazardly, large quantities of water have been located in fractures in hard, impervious rocks and failures to obtain a supply have occurred in argillaceous sandstone. A general geological study will indicate the existing water conditions, the type and extent of the forma-



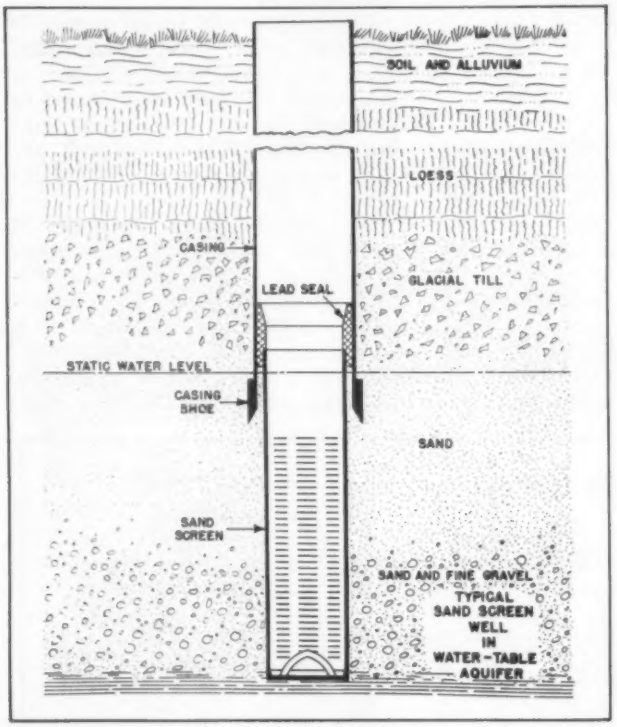
● **GRAVEL** wall well in an artesian aquifer. Cost of such a well is usually greater than for a sand screen well but capacity and length of life are greater.

tions, the under-ground faults and other geological reconformatives that affect the development of a water supply. The amount of moisture which a soil or rock will hold is not as important to the water works engineers as is its carrying capacity and ability to yield water when previously saturated. The best aquifers are deposits of gravel which have high porosity, permeability and specific yield. However, some deposits may have a matrix of dense, compact material that makes them worthless as a water producer. interstices between the particles are so small that although they are quite porous materials, very little water is yielded. The materials are too soft to have joints or secondary openings.

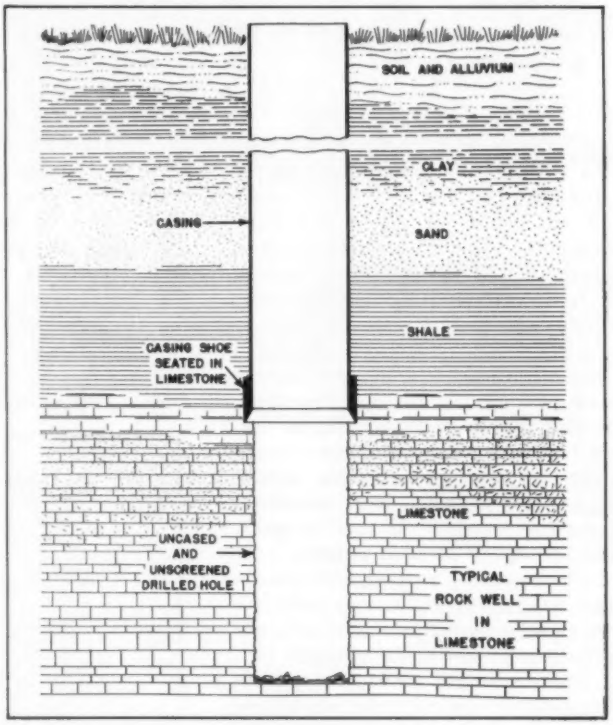
Geophysical exploration has been used successfully for locating water supplies in virgin territory. A virgin territory is one in which there has been no previous exploration, nor any determination of the formation by drilling test wells. The resistivity method of surveying, while not infallible, is widely used and has services of some one who is experienced in making this type of survey.

Use of Test Wells

After the geological studies have been made and the area selected, the next step is to determine the extent of the area and the depth of the formation by means of a series of test wells. Drilling the test well is the most important phase of ground water development. A series of test wells in an area will indicate correctly the extent of the forma-



● **SAND-screen well in water table aquifer. Screen openings must be sized to prevent sand entering the well.**



● **ROCK well in limestone formation. In such cases the well below rock need not be cased or have a screen.**

Next in value to gravel as an aquifer are sand, sandstone, limestone, and basalt. Sand and sandstone are usually of greater volume than gravel beds but since the pores are smaller, they conduct water less readily. Limestone may be one of the best aquifers, or as unproductive as shale, depending on the original texture of the material and the extent of solution by the percolating waters. Basalt probably will yield quantities of water through joint openings and other cavities.

Many rock materials, such as the fine-grained and poorly assorted unconsolidated deposits, and the shales, may not yield water freely but may be necessarily used when good aquifers are not available. The true clays and fine silts are the most unproductive of all materials. The proven valuable in locating ground water supplies. An electric current is passed from an instrument through the ground between two electrodes. The resistance of the ground to the current is tested by tapping into the ground circuit. Two other electrodes are placed in line with the current electrodes. Then the loss of potential between these inside points is observed. The distance between the electrodes determines the depth to which the resistivity of the formation is measured. The formations offer varying resistance to the current, depending upon the composition of the material. By checking these formations with a driller's log, and cuttings from a test hole, it is possible to map the area for the location of test wells. This method requires the tions, any changes that might occur between test well sites, and the possibility of expansion for future water supplies. In drilling the test hole, it is advisable to penetrate all of the water sands that have not been explored, if economically possible. Furthermore, exploring all of the water bearing formations makes it possible to obtain the best quality of water that is available. If drilling a test hole is worth doing at all, it is worth doing well. The cost of a test well is minor, as compared to the cost of the permanent well. From the test well, formation samples and water samples are taken and analyzed.

Water wells, basically, are of two types: (1) water table; (2) artesian. Both are dependent upon rainfall for recharge of the aquifer. In the

water-table well, the aquifer receives its water by percolation of rainfall from the ground surface. The aquifer is underlain by an impervious formation, which retains the water above it. The static water level in the well will be the same as in the formation and the ability of the well to yield water will depend upon the permeability of the formation and the amount of rainfall in the area. Such wells suffer from recession of water level in dry climatic cycles.

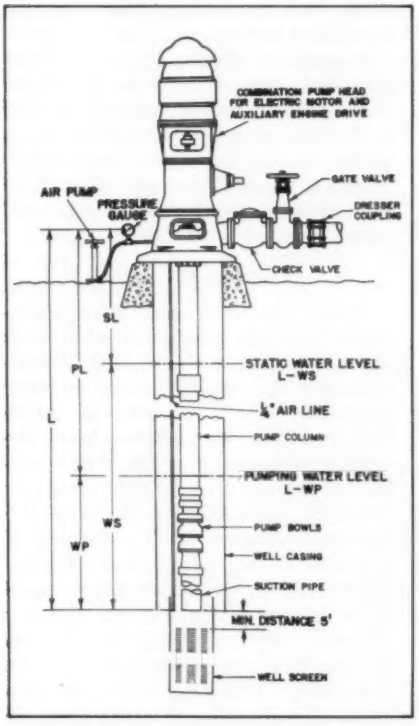
An Artesian well is one in which the water level rises above the point of penetration into the formation. As in the water-table well, it is dependent upon percolation of rainfall for its replenishment. However the aquifer formation outcrops at some distant point from the well area and is overlain by an impervious formation which confines the water in its stratum. Since all formations generally slope to the sea, the water in the artesian aquifer then percolates to the well site under confining pressures, which cause the water level in the well to rise above the formation. Artesian wells do not suffer from dry climatic cycles, unless such are of long duration over a period of years.

From the information revealed by the geological studies and the test wells, the diameters and type of construction of the permanent wells are determined. In general, the diameter of the well casing should be sufficient for the installation of the pump of the highest expected capacity and efficiency. When selecting the correct casing diameter, one should consider the possible increased production from the well if the formations will permit increased pumping.

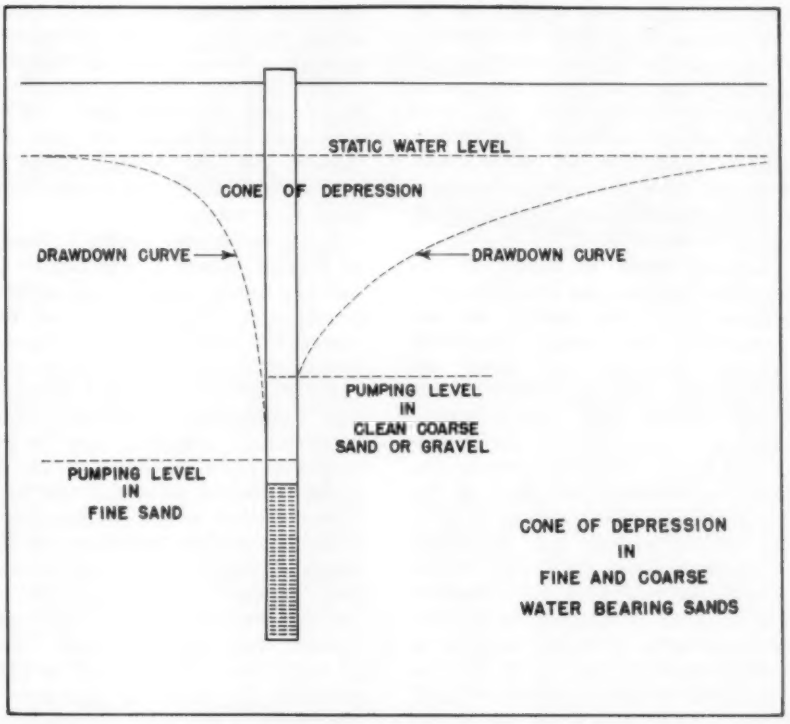
The type of well construction is based upon test hole information. If the well is drilled into a consolidated formation, the casing is seated into the rock and, usually, the hole penetrating the rock to the desired depth is uncased. If the formations are unconsolidated, then the well may be of the sand-screen or the gravel-wall type. In either event, sanitary conditions and protection of the water supply from contamination must be considered.

A sand-screen well is one in which the well screen is in direct contact with the water-bearing formation penetrated. Therefore, the openings in the screen must be of such a size that they will retain the formations and prevent their entrance into the well. The gravel-wall well is one in which the well screen is surrounded by an envelope of gravel. This increases the area of contact between the formation and the well screen, thus diminishing the velocity of the entering water. The gravel used should be of a size that will prevent the entrance of particles of sand into the well proper.

The cost of gravel wall wells is usually greater than that of sand screen wells, but the resulting increase of capacity and prolonged life usually justifies the increased cost. The cost of well construction is variable as a well is not an item which can be taken from the dealer's shelf, ready to use. The depth of the well; types of formations to be penetrated; materials, diameter and extent of casings and screens required; methods of drilling; type of well construction; and amount of water required and available are variable. However, with the services of a water-supply engineer, specifications may be written so that reliable competent water well contractors may submit prices for the types of construction recommended. These quotations and the time required for installation will be found economically less than the requirements for extension of a surface water system.



● **PUMP and airline for use in measuring the static water level.**


STATIC WATER LEVEL
CONE OF DEPRESSION
DRAWDOWN CURVE
DRAWDOWN CURVE
PUMPING LEVEL IN CLEAN COARSE SAND OR GRAVEL
PUMPING LEVEL IN FINE SAND
CONE OF DEPRESSION IN FINE AND COARSE WATER BEARING SANDS

● **CONE of depression depends on formation in which the well is sunk and on the rate of pumping. This shows typical drawdowns for fine and coarse formations.**

Specifications

It is doubtful if a set of standard well specifications could be drawn that would cover all of the various types of wells and methods of con-

struction. In general, the specifications should give all of the vital information necessary for the well contractor to submit a bid. Specifications should not be unreasonable, but should be brief and to the point. Yet, they must tell the story of the work to be done and the manner in which it is to be done. Drilling a water well is not a standardized procedure. Conditions will vary widely from one area to another. These conditions impose other variables so that many types of wells and methods of drilling have been developed. Each type of construction and method of drilling has its own merits that make it adaptable to a particular set of conditions. If properly constructed for the special requirements, the well will yield water of a sanitary satisfactory quality. The best of construction, however, does not release the water works operator from the responsibility of maintaining the supply.

Ground water is known as the universal solvent. As the water percolates from the earth's surface through to the water formations, various minerals and gases are picked up and dissolved in the water. When this water finally reaches its own level in the formation, it forms what is known as the static water level. As long as the water remains in its normal state in the ground and is not disturbed, the gases and minerals will remain in solution in the water. Whether the water is in a confined formation and under artesian head, or in a watertable it rests in the formation under a certain pressure head. When a well is pumped, the water level in the vicinity of the well is lowered.

Lowering of the water level is equivalent to the reduction of pressure in a pipe-line. It is caused by the friction of the water flowing through the formations. The reduction of the pressure tends to liberate dissolved carbon dioxide as a gas. Consequently, the minerals which were in solution in the water by virtue of the carbon dioxide are converted to the insoluble state. The insolubles settle from the water and form incrustations in the well pump, on the well screen, and have been known to deposit in the formation. Liberated carbon dioxide is, to a certain extent, corrosive to the well and pump materials. The more water pumped from a well, the lower the water level in proportion. In each well and in each formation there is an optimum limit to the production. Experience has taught that if the well is pumped beyond its optimum limit, deposition of precipitates will be multiplied many times. Thus, over-pumping of the well may be the direct cause of production loss from the well.

An analysis of the water sample obtained from the test well will indicate the corrosiveness of the water. If corrosive conditions are known to exist, or the geological studies indicate that they might exist, it is advisable to construct the well with materials which will resist the corrosion attack. In many cases it is only necessary to have the well screen and blank casing above the screen made of resistant material. Metals, such as Stainless Steel, Everdur Bronze, or Monel Metal, are commonly used. When corrosive conditions are not expected the well screen materials may be of iron, steel, galvanized iron or wrought-iron.

In general, the sanitary quality of ground waters is satisfactory for use in a public water supply without purification. The amount of dissolved minerals and other characteristics inherent in the water may require its treatment for domestic and industrial purposes. Such treatment, if required, may be anticipated from an analysis of the water obtained from the test well. Those waters which require treatment for specific purposes or because of excessive mineral content may generally be treated by the ion-exchange methods at very reasonable costs. Occasionally, a water of high iron content will require aeration. In any event, the cost of treatment is less than for treatment of surface waters.

No water well is complete without a pump, unless it is of the flowing type which in these times is rare. Most pumps are of the deep well turbine type with the motor above ground and a driving shaft to the pump bowls in the well. This shaft may be open to the water in the pump column as the water-lubricated pump; or enclosed in an oil tubing as the oil-lubricated pump. The materials used in construction are variable to suit the quality of the water pumped. The most efficient well pump is one specifically designed for the individual well construction on the basis of capacity, total head, efficiency, etc.

Recently submersible motor pumps have been made available. These operate with the motor below the pump bowl in the well. The need for line shafting to the surface is eliminated, but the power cable must extend in the well to the motor.

Each type of pump has its own advantages and disadvantages when compared one to another, and one will be found most suitable for each specific case. A distinct advantage is inherent in pumps with above ground motors when considering water shortages and possible power failures. In pumps of this type combination heads are available in which the electric motor operates the pump but when power failure occurs, service can be continued with the pump operated by an auxiliary engine.

Regardless of the type of pump installed, each should be equipped with a check valve, gate valve, and a flexible coupling expansion joint at the line to the mains. If economy permits, recording meters should be provided to record water pumped and hours of operation.

Testing the Well

After the well has been completed and the pump installed, it is desirable to test the well to determine its capacity. The rate of flow from the well is determined while the drawdown or pumping level remains constant for a specified number of hours. The pumping water level in the well should always be five feet or more above the top of the well screen as a factor of safety. Should the pumping water level drop below this point, the danger of water aeration in the top portion of the well screen increases, with consequent plugging from precipitates. The quantity of water pumped in gallons per minute is measured economically and efficiently by the use of an orifice pipe and plate attached to the discharge outlet of the pump.

When a well is drilled and allowed to stand idle for several hours after development, the water rests at a definite level in the well known as the static water level. As soon as the pump starts to discharge water from the well, the water level lowers in the well. This is known as the drawdown and varies practically directly with the rate of pumping. The point to which the water level is lowered is the pumping water level. Maximum drawdown occurs within the well. At greater distances from the well, the amount of drawdown in the formation becomes progressively less. The well that produces from a fine sand will have a large drawdown and will

(*Continued on page* 186)

wells, the diameters and type of

and the well screen, thus diminish-

types of wells and methods of con-

Modern 200-ton Incinerator For Framingham

TO PROVIDE sanitary and economical disposal of refuse, Framingham, Massachusetts, has just completed construction of a 200-ton incinerator. This replaces a 60-ton unit built a number of years ago, and recently seriously overloaded. For reasons of economy, the old building was remodeled and expanded to house the new incinerator, which is of the traveling grate type with two furnaces of 100-tons capacity each per 24 hours.

Design of the plant is based on a present population of 32,000 and a population of 42,000 in 1975. Presently, collections amount to about 32 tons per day, or 2 pounds per capita; the peak day collection is about 42 tons. With allowance for future growth and for an increased per capita production of refuse, design was fixed at 66 tons per 8-hour operating day.

The remodeling project included construction of a 2-compartment receiving pit into which incoming refuse is dumped. Each compartment has a capacity of 30 tons, about 225 cu. yds. of refuse. Partly to improve the appearance of the building, but also to provide shelter for the receiving area, a new front was added to the building. Over the receiving pit, a bridge crane with a 1½-yd. bucket was installed. Operation is from a pulpit in the scale house, with a plastic bubble type of window to provide a good view of operations while excluding dust and dirt.

The incinerator furnaces are rectangular, with a horizontal traveling grate type stoker having 173 sq. ft. of grate area, with a stoker width of 7 ft. 3¼ inches. The furnaces have water walls, composed of 2-in. tubes on 4-in. centers backed with castable refractory. The exterior is sheet steel.

Furnace volume is 2650 cu. ft. and there is no secondary or combustion chamber. The gases pass from the furnace directly to the scrubber. Water cooling is by forced circulation of the water through the water walls and then into the scrubbers, which are designed to eliminate the fly ash. Residue discharged from

● **SKETCH by the architect of the 200-ton incinerator now being completed at Framingham, Mass. Its many modern features are described in this article.**

the traveling grates pass through a water-cooled air lock and to a steel conveyor which discharges to a 30-ton overhead bin arranged for gravity loading of trucks. Fines that may sift through the grates are removed by a vacuum system and deposited on the ash conveyor.

Instrumentation

Instruments are provided to record the temperature of the flue gas, the furnace walls, the spray chamber, the scrubber exit gas and the water entering and leaving the furnace walls. Also recorded are the water flow entering the furnace and leaving the scrubber, the stoker speed and the inlet and induced draft fan operations. Controls are installed to regulate the overfire air fan inlet vanes by the flue gas thermocouple to maintain a temperature of 1600° leaving the furnace. These controls reduce the needs for manual operation to the adjustment of stoker speed to insure that the refuse is completely burned before it reaches the end of the grate and passes into the rotary air lock. An aquastat and a motor operated butterfly valve control the flow of water through the furnace walls, maintaining a predetermined temperature between 200° and 250°F. Scales with a capacity of 50 tons record the weight of the incoming refuse.

The hot water leaving the furnace walls will be used to heat the incinerator building and the Sanitary Department Garage. A storage tank is provided to accumulate and hold the heat necessary for the shutdown period at night and over week-ends. The building heating system is of the closed circuit type using a heat exchanger to transfer heat from the furnace water to the heating system.

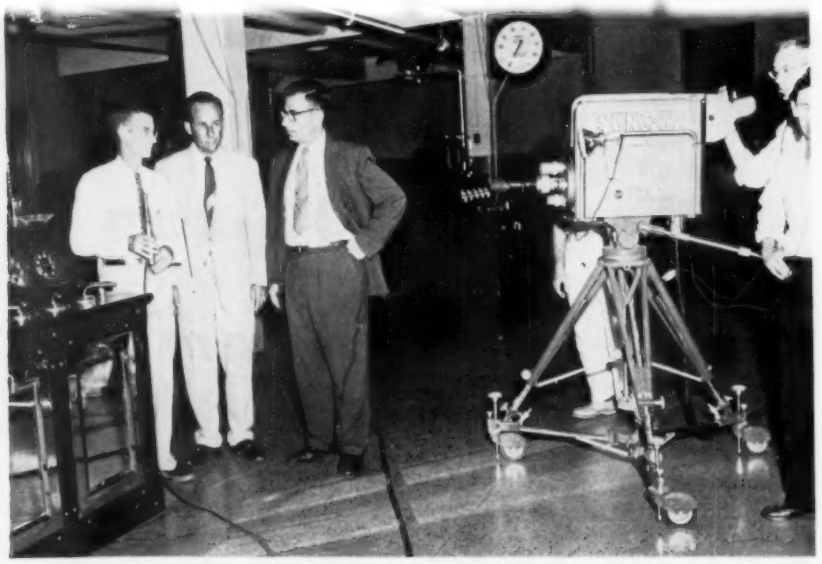
The garage for the Sanitary Department provides housing for 10 packer-type trucks, with garage facilities, including greasing and repairs. A shower and locker room are also available for department personnel.

The Commissioners of the Public Works Department of Framingham are: A. M. Colonna, Chairman; John T. Dias; and John M. Warren. William G. Paxton is Director of Public Works; and Primo Silva is Superintendent of the Sanitary Department. Cotton, Pierce & Streander, Inc., of New York, were consulting engineers. The plant was completed late in July at a cost of $415,000 and is now being placed in routine operation.

production. Experience has taught need for line shafting to the sur-

(Continued on page 186)

TV SHOWS H_2O AT UNC



● **TELEVISED visit to the Chapel Hill, N. C., water treatment plant is featured in UNC's "Project: Health" series. At this stop on the filter operating floor Plant Superintendent Max Saunders (left) explains controls to Dr. Demeritt and Dr. Okun.**

A PRETTY young thing was drawing water from the tap and was about to raise the glass to her lips when a voice interrupted, "Stop! Are you sure that water is safe?"

The voice was that of Dr. William V. Demeritt, of the School of Dentistry of the University of North Carolina, moderator of the series of programs sponsored by the Division of Health Affairs of the University entitled "Project: Health." Before the girl had her drink, she, together with the television audience, had the opportunity of watching an hour-long program staged by the Department of Sanitary Engineering of the University's School of Public Health in cooperation with the Utilities Division of the University over the University's television station WUNC-TV. The program was built around a tour through the Chapel Hill water filtration plant which is owned and operated by the University.

The program was begun by Dr. Daniel A. Okun, Head of the Department of Sanitary Engineering, explaining to Dr. Demeritt the importance of water supply in public health and the problems associated with procuring an adequate quantity of water of safe quality. Mr. Joe Hakan, University Engineer, described the history of the Chapel Hill water supply and showed on aerial photographs and topographic maps the watershed area, University Lake, and other of the major facilities insuring sufficient storage to provide water even in the most serious drought periods. Following this, Dr. Okun explained the principles of water purification through the use of charts, models, and a blackboard. Mr. Max Saunders, Superintendent of the Chapel Hill water filtration plant, then took Dr. Demeritt and Dr. Okun and the television audience on a conducted tour of the plant, including the point of entrance of the water supply into the plant, flocculating and settling basins, chemical feed equipment, filters, pumps, and chlorinators. A highlight of this part of the program showed the washing of a filter. Mr. Saunders also demonstrated how the safety of the water is checked by laboratory tests.

The final item on the program was a description of the distribution system by Mr. Grey Culbreth, Superintendent of Utilities for the University. Mr. Culbreth also demonstrated the operation of the water meters and how to read one.

At the end of the program, the young lady was seen drinking that glass of water.

The program was recorded on a Kinescope and can be used for other purposes inasmuch as the Kinescope can be projected with the ordinary 16 mm. sound projector. It is felt that it should be possible for other communities to take their public water supply and sewage disposal facilities to the public so that they can see and understand the services that are being furnished them by the community. Where relatively few citizens of a community may visit their water and sewage treatment plants, many more of them can be reached via television.

• • •

What A New Family Means to the City Budget

The effect of moving 100 new families into a community has been studied and reported on by the American Society of Planning Officials. Assuming 4½ people per family, the 450 new people would mean 5 or 6 additional city employees; an increase in the police budget of $4510 per year; an addition to fire expenditures of $2820 per year; a general annual payroll increase of $10,000 or more; more library and hospital costs; and $30,000 a year more on the school operating budget.

fly ash. Residue discharged from

WHAT EVERY CITY CAN DO ABOUT

CIVIL DEFENSE

EDDY S. BRANDT, Civil Defense Director, Evanston, Ill.

EVERY city has a problem in Civil Defense. Every Civil Defense organization has more questions than it can answer:

How far will radiation work its calamity?

Should we have a block warden system?

Shall we evacuate? If so, how can we do it in so short a time?

We have looked for the answers to these important questions and found many that differed greatly. If the government authorities do not agree, how should we determine which is right?

So we decided the best answer was simply to develop a complete framework of Civil Defense for the city. Then, if an attack or a disaster came we would at least have the various departments formed, ready to recruit the help needed for each.

By using the important officials of the city, such as the Commissioner of Public Works, Chief of Police, Chief of Fire, Health Commissioner, etc., and by adding a number of civic leaders, a well-rounded organization was effected. After several discussions, we appointed three assistants to the director: Joseph L. Rose, director of Public Works in Evanston; William O. Campbell, a Civil Air Patrol colonel; and Earle Press, realtor and structural engineer. Chief H. G. Kelsh heads the police division; Chief Henry Dorband, the fire; Dr. W. H. Tucker, the Public Health Commissioner, organized the medical division.

Then we drew on important citizens. Dr. O. M. Chute, superintendent of public schools, took the job of deputy in charge of public information; J. C. Sprague, manager of the Evanston branch of Illinois Bell, looks after communications; John Happ, township supervisor is in charge of welfare; Grant Bergsland, vice president and general manager of the Evanston Bus company, heads up transportation; Nathan Bederman, owner of a large paving company, is deputy in charge of utilities and engineering; and G. J. W. Moss, who was in the signal service of the British Army during World War I, and was a regional Civil Defense official in the Evanston area during World War II, is organizing the warden services.

In addition, W. G. Hinkle, a former U. S. Navy man, is supervisor of the Ground Observer Corps, and William G. Fowler, a boat owner, is in charge of our small craft division.

● **COMMITTEE plans one-day construction of Eadie Field, an emergency air strip.**

Since our reorganization, which started in October, 1953, several jobs have been accomplished or begun by almost all of these divisions.

One of our first jobs was the construction of an emergency landing field, west of Evanston, along the bank of the Sanitary canal. The field is a north-south sod and clay strip, 75 feet wide, 1616 feet long, with 500 feet of freeway at either end.

Mr. Campbell undertook the work of organizing this field. With the help of Mr. Bederman, Mr. Rose and others, a group of construction men and machines was rounded up, went to work one morning and had the field graded and leveled in a few hours. Several months later, an ambitious air program marked the dedication of the strip.

At the same time, we began installing the six sirens which state engineers found were needed to give Evanston sufficient coverage. By early 1955, five had been connected and the sixth is to be hooked up as soon as the fire station, on which it is to be mounted, is completed.

With the fire sirens, air raid shelters were needed. Mr. Press took on that job and located 45

Joe Hakan, University Engineer, de-

glass of water.

erating budget.

public buildings—schools, churches, libraries, business buildings—which offered basement protection. These are now all marked with white signs bearing the words "Air Raid Shelter" on a red, bomb-shaped field. Further shelters in residential areas and some which will be open day and night are being located. Mr. Press has also been able to offer advice to factories and other business concerns regarding shelter locations for their employees.

Out of a mass of bulletins and pamphlets, on what to do in case of an attack, we selected the following few but concise instructions to give to residents:

Under the medical director, a program of securing a file of donors of Type O blood, needed quickly in event of emergency, is now being conducted by volunteers. The three Evanston hospitals are organizing their staffs and facilities for immediate action in emergency. An offer by the state government of five 200-bed emergency improvised hospitals has been accepted and doctors are studying how these can be used to best advantage.

Under communications, the sirens have been installed; a bell and light system which give 24-hour warning service is in; a control center has been established; and a

● **RESCUE trailer carries hundreds of items for almost every kind of rescue work.**

The air raid sirens are tested every Tuesday morning at 10:30, but if you should hear the sirens at any other time, you know it is warning of a real attack. If you are downtown away from home, take shelter in the basement of one of the public buildings. If you are home, go to the basement and hide under a heavy table or other strong material against the south wall. In preparation, you should visit the basement, find the gas cut-off, place the sturdiest protection you can find against the south wall, have ready at hand a flash light, battery radio, canned food and a supply of sealed water. The radio is important because in event of an attack, instructions will be received over the radio on specified channels.

ham radio operator has been appointed to the Civil Defense staff to organize that end of communications. In addition, two-way radios are being installed between the director's home and the police headquarters, as well as several other two-way ties.

Under welfare, air raid shelters have been established; the American Legion auxiliary and PTA's have agreed to study the problem of mass feeding; the American Legion has appointed a rescue squad team to learn to use the rescue equipment which has been bought; the Paper Cup and Container institute has contributed 100,000 cups for use in emergency or for training purposes; and the Diaper institute has agreed to contribute worn, sterile diapers for emergency use.

Under transportation, the biggest problem now is the study of evacuation. The deputy has appointed a committee of railroad men, moving van men, and a traffic engineer, who are laying definite plans to be ready when needed.

The warden services deputy is making an intensive study of how best his organization can be used in evacuation, how many persons are needed and how they can be trained. He has a strong nucleus of about 40 wardens, who assisted last summer when an air raid exercise was held. They made 2,000 phone calls in an evaluation survey after the drill. After consulting the Evanston City Council, the corporation counsel was asked to prepare an application blank that will remove the danger of liabilities of volunteer workers. This would also protect the police and firemen's pension funds.

The Ground Observer Corps has established an 8-hour watch and is working toward 24-hour schedule. The Small Craft Fleet is registered and ready for use or an exercise.

From this report, it can be seen that a Civil Defense organization is difficult to set up, but nevertheless is a real necessity. I feel that the framework is now ready for active recruiting. As interest in the Civil Defense Corps increases and volunteers join one or another of the division, training will move ahead and we will at least be ready to get our corps into action.

No, we do not know the answers to the many Civil Defense questions and problems. But we do realize that the laying of the ground work for a city-wide Civil Defense organization can and should be done at once.

We need not wait for the answers to do just that. Maybe we will find the answers by so doing.

• • •

Principal Commodities Purchased by Ohio Department of Highways

Listed below are some of the principal commodities, purchased during 1954, by the Bureau of Purchasing, State of Ohio.

Liquid Asphalt	7,174,093	Gal.
Bit. Concrete	86,168	Tons
Road Tar	1,861,930	Gal.
Aggregate	1,009,430	Tons
Gasoline	6,911,818	Gal.
Calcium Chloride	1,398	Tons
Sodium Chloride	79,921	Tons
Lumber	1,366,080	B.F.
Paint	223,116	Gal.
Motor Oil	102,630	Gal.
Grease	115,944	Lb.
Cement	5,130	Bbl.
Coal	10,037	Tons

A BETTER METHOD *for* MEASURING SMOKE DENSITIES

IN AIR POLLUTION studies and control, the familiar Ringelman chart, in use for some fifty years, has gained such general acceptance that it is the standard for almost all smoke control ordinances. It does have limitations as a method of measurement and many attempts have been made to devise improved instruments that could serve better as comparators on stack discharges. The Ringelman chart gives only a comparison of smoke with black and three shades of gray, its reading is affected to some degree by light conditions, and it does not give results that can be expressed in sharply defined terms, such as are common in engineering work.

Any workable instrument for air pollution work must give results which can be correlated with Ringelman results because of existing ordinances. Other desirable features for such an instrument should include: Convenience of use; elimination of the effects of intensity and incidence of light on the smoke plume; elimination of the effects of differences in illumination of the chart; and provisions to permit comparison readings without changing eye focus.

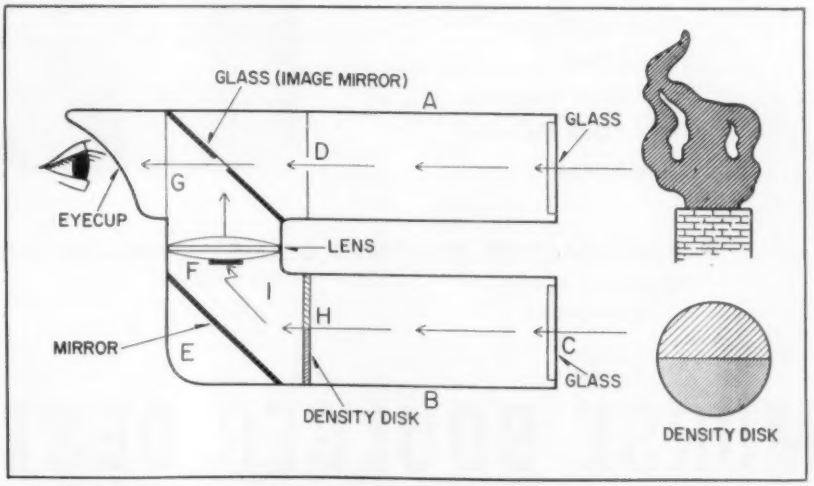
A "Smokescope" has been devised by Mine Safety Appliances Co. which is said to combine these various features. It utilizes the principles of the Nyder gun sight. The image of two reference standards, shades 2 and 3 of the Ringelman chart, are projected into space adjacent to and in the same focal plane as the object of study. The reference standards were reduced from four to two when it became obvious that smoke densities greater than shade 3 violate *all* existing ordinances and densities less than shade 2 violate *none* of them. The convenience gained by this arrangement outweighed the perhaps desirable but unessential correlation with all four Ringelman shades.

As shown in the diagram, the same background lighting for the smoke as for the reference standard is obtained. The stack is viewed directly through tube A in which the apertures limit the field of vision to the area over the stack and prevent entrance of stray light. Only the light from the area adjacent to the stack illuminates the reference film disk in tube B. This light projects the reference image through a lens to the image mirror where it may be seen surrounding the smoke plume for easy comparison at the same focal distance as the smoke. The image of the center portion of the reference disk is blocked out at the center of the lens so that it will not interfere with clear vision of the smoke through the aperture.

The lens serves also to intensify the light in the reference standard optical path to compensate for light loss at the reflecting surfaces. This intensification of light is accomplished by concentrating the light entering tube B into a smaller area on the image plate. A tremendous amount of work went into the design of the optical system to provide compensation for light losses through the optical elements of the instrument.

Several instruments of this type were built with varying lengths and diameters of tubes. A unit approximating the size of a small binocular proved most satisfactory in a series of field trials, and was most convenient to use. Field experience of a large number of people went into the development of the instrument in its final form. The shield for the eye of the observer was one of the refinements made as a result of field tests. It cuts off light from behind the observer and thus eliminates reflections from the eye piece which were especially annoying to observers who wore glasses.

The Smokescope in its final form is believed by the manufacturer to make available to smoke control engineers for the first time a means of measuring smoke densities that combines the advantages of convenience, simultaneous viewing of the smoke and comparison standard, and reproducible results regardless of variation in background lighting or incident light. Although the instrument does not solve all problems of smoke estimation, it provides a means of supplementing the skill and improving the accuracy of experienced smoke observers.



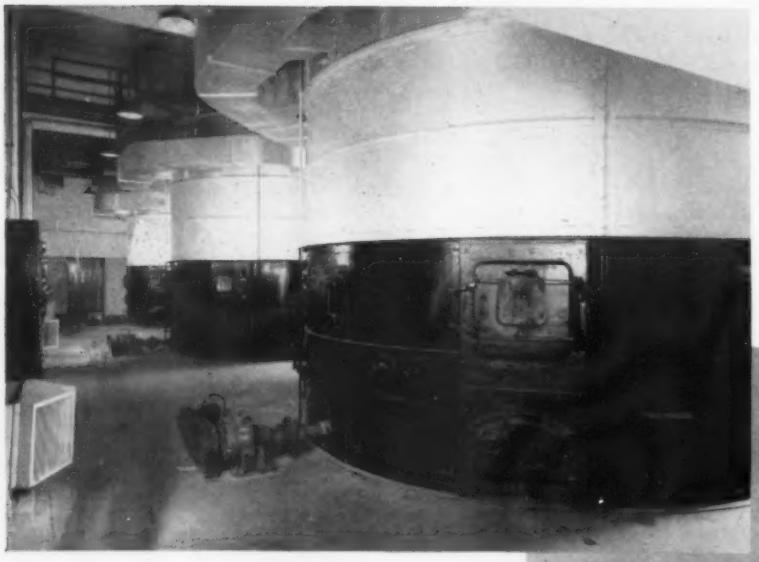
● **SCHEMATIC diagram shows how density of smoke rising from stack is determined. Image of reference disc permits direct comparison with smoke from stack.**

Another Morse Boulger Project!

MODERN INCINERATION!

TWELVE MICHIGAN COMMUNITIES* GROUP TOGETHER FOR CENTRALIZED COLLECTION AND LARGE PLANT ECONOMY

WELCOME
To Our Exhibit
BOOTH C-10



Left:—Operating Floor with three Morse Boulger circular mechanically stoked incinerators, 16'—0" diameter.

Below:—Front View of plant

* Berkley
Birmingham
Clawson
Ferndale
Hazel Park
Huntington Woods
Oak Park
Pleasant Ridge
Royal Oak
Southfield Township
Royal Oak Township
Troy Township

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convenience gained by this arrange-

mined. Image of reference disc permits direct comparison with smoke from stack.

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Preliminary Program Announced for 1955 Congress

AN INFORMATIVE and diversified program has been arranged for the four-day session of the 1955 Public Works Congress and Equipment show to be held in Milwaukee, Wisconsin, October 2nd to 5th. Municipal officials will again have the opportunity to participate in question-and-answer groups, see the latest in equipment and materials, listen to helpful and authoritative papers and enjoy entertaining get-togethers and parties.

Following registration, Sunday's session will be devoted to a review of equipment exhibits and the always popular Get - Acquainted party, this year to be patterned in true Milwaukee style, a Gemuetlichkeit Stunde". Monday morning opens the formal business of the Congress with an address of welcome by Hon. Frank P. Zeidler, Mayor of Milwaukee. Two papers will be presented at this session: "Construction is Only Half the Job" by Walter H. Blucher, Consultant, American Society of Planning Officials, and "Public Liability in Public Works" by Orville C. Peterson, Attorney, League of Minnesota Municipalities. The annual business meeting of the Association will be held following the papers.

On Monday afternoon three concurrent sessions will be held, at each of which there will be an informative paper and a discussion forum. Session 1 features a paper on "Public Works Aspects of Civil Defense" by E. L. Knebes, Milwaukee's Assistant City Engineer, together with an "Equipment Management" forum for which R. S. Hobson, Director of Public Works of Richmond, Virginia, will be chairman. At Session 2 the paper will be "Air Pollution Control Developments" by Dr. Louis M. McCabe, Scientific Director, Division of Sanitary Engineering, U. S. Public Health Service. L. B. Allan, Commissioner of Works and Roads of Toronto, Ontario, will be chairman of the forum on "Construction Contract Administration" held at this session. A paper on "Public Works Research" presented by Professor Earnest Boyce, Chairman of the Department of Civil Engineering, University of Michigan, will open Session 3, which features also a forum on "Sub-Surface Utility Regulation and Coordination," with Edward F. Koester, City Engineer, Wilmington, Delaware, as chairman.

Sixteen question and answer tables are arranged for the morning session of Tuesday, October 4th. In the first group, running concurrently, the topics will be Planning and Zoning; Public Relations; Street Construction; Refuse Disposal; Street Sanitation; Maintenance of Public Buildings and Grounds; Building Inspection; and Sewage Disposal. The second group will discuss Street Maintenance; Cost Accounting; Parking and Traffic Controls; Storm and Sanitary Sewers; Financing Public Works; Work Safety; Street Lighting; and Water Supply and Distribution. Each table will be staffed by a well qualified moderator and reporter. During the afternoon session Dr. Harold C. Taylor, Director, Upjohn Institute for Community Research, will present a paper titled "Public Works Policies for Boom or Bust". "The Administrative Manual — A Tool for Management" will be presented by John Craig Oliver, City Engineer of Vancouver, British Columbia. Following this a paper entitled "Apprentice Training and the Manpower Problem" will be presented by Fred Erhard, Assistant Director of the Bureau of Apprenticeship, Department of Labor.

Two papers will be presented by Federal Government officials during the Wednesday morning session: "Public Works and Community

(*Continued on page* 175)

President
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Vice-Presidents
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Kenneth K. King Albert G. Wyler

Past President
Milton Offner

Directors
Frederick W. Crane Roy W. McLeese
Raymond A. Williams W. D. Hurst

Treasurer
Robert L. Anderson

Executive Director
Donald F. Herrick

Equipment Show and Special Events

Over seventy of the nation's leading manufacturers of public works equipment will participate in this year's equipment show. The exhibits will be open from 9 A.M. to 5 P.M. on Sunday, Monday, and Tuesday October 2, 3 & 4) and from 9 A.M. to 3 P.M. on Wednesday (October 5).

Entertainment begins on Sunday afternoon with a Milwaukee-Style Friendship Party known as a "Gemuetlichkeit Stunde", and ends on Wednesday evening with a top-flight floor show sponsored by the Local Committee. Special events include a Tuesday Evening Party with the compliments of The Heil Company and a Social Hour sponsored by the International Harvester Company prior to the Annual Dinner, Wednesday evening.

A full program has also been arranged for the ladies, including a tour, tea, and luncheon featuring a caricaturist,—plus a style show at one of Milwaukee's famous department stores.

Get full details of this month's products . . . mail your Readers' Service card today.

THE BUFFALO-SPRINGFIELD K-45 KOMPACTOR

How to select compaction equipment

The logical question to ask yourself when you are ready to buy new compaction equipment is: "Exactly what do I need the equipment for and how will I use it?"

BASE FILL COMPACTION—This type of compaction demands equipment that will handle a wide variety of materials, give you the highest degree of compaction with the fewest passes. Buffalo-Springfield's revolutionary K-45 Kompactor is proving a real money-making answer for this type of work. It is self-propelled, relies on the "Interrupted Pressure Principle." All compaction effort is directed downward. Contractors testify they are meeting density requirements in one-fourth the time normally required with other compaction equipment.

FINE GRADE FINISHING—Buffalo-Springfield offers six 3-wheel rollers, ranging in capacity from 5 to 15 tons, to handle the large variety of materials found in fills, subgrades and unfinished bituminous pavements. The variable-weight 3-wheel roller is ruggedly built for years and years of hard, maintenance-free work.

Buffalo-Springfield's thoroughly-proved 3-axle tandem "walking beam" roller provides up to 60% greater tonnage compacted per day in superhighway construction, airport and military establishment jobs where specifications are extra strict.

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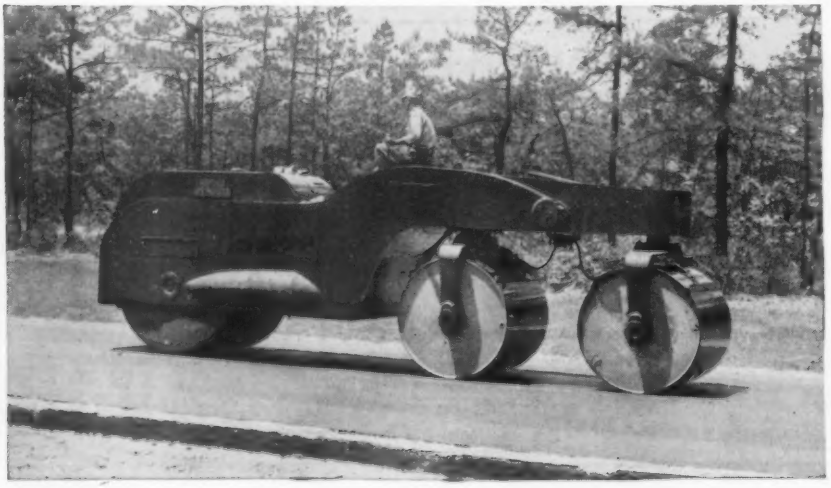

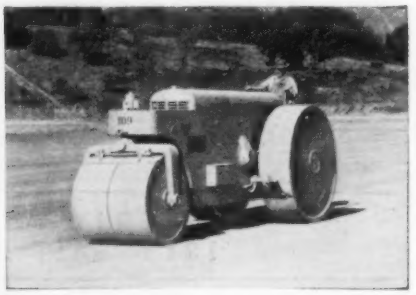

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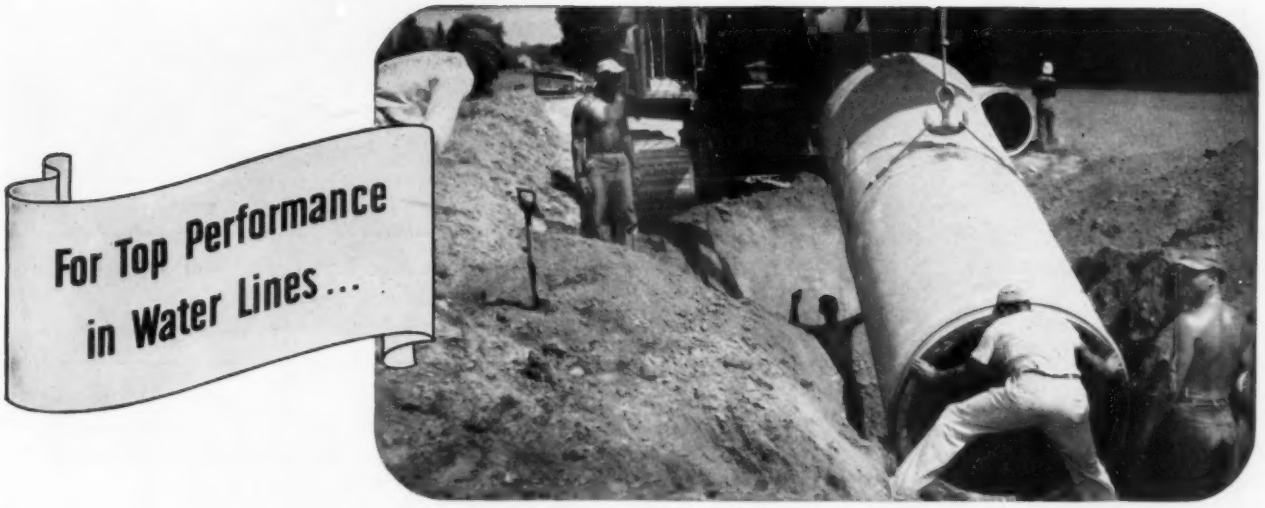

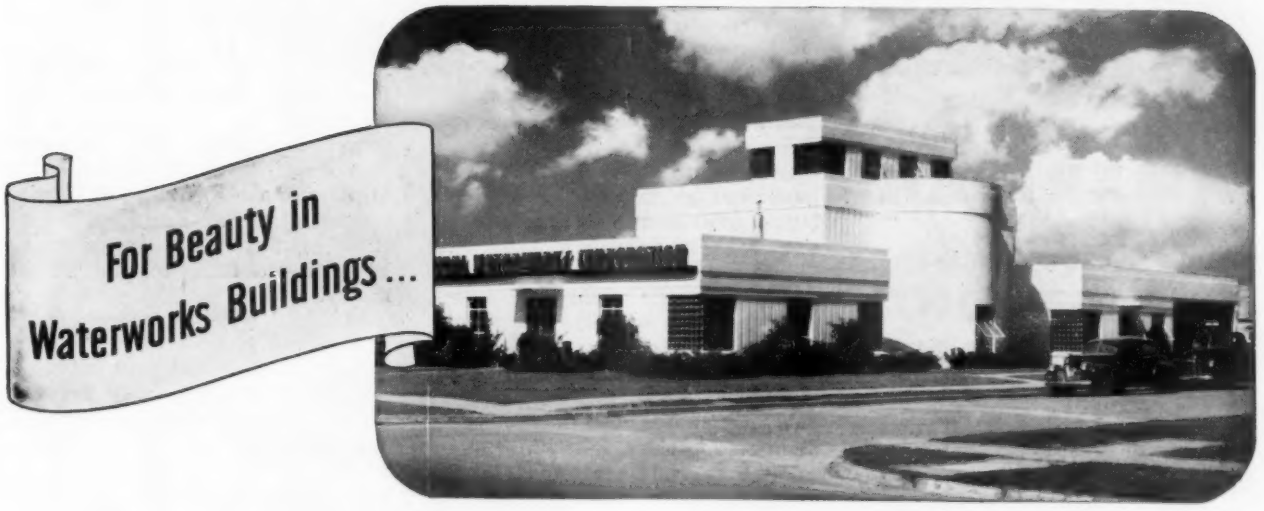

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BRANCH PLANT AT NAHMA, MICHIGAN

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

THE WIDE split in both Republican and Democratic ranks in the House on the new road user taxes vs. bonds proposals to finance a multi-billion dollar highway program not only killed off the federal-aid highway legislation in the closing hours of the first session of the 84th Congress but may also dim the chances of getting the program "back on the track" when Congress reconvenes in 1956. After failing to push through the President's road building program, as carried in the so-called Dondero substitute bill, the Republican members split on the Democratic "pay-as-you-go" measure (Fallon bill) and joined Democratic dissenters in killing off the latter measure. The growing sentiment across the country for bold action to cure the nation's highway problem failed to overcome both "intra-party" and "inter-party" strife that developed on the House floor in the acrid debates on both bills. The battle was joined almost exclusively on the financing features of the program. Unless members of Congress encounter strong local pressures to resolve their differences in light of the nation's pressing need for new and better highways, there is a strong feeling on the part of many observers in Washington that a renewed drive for the legislation in 1956 will run into the same kind of road blocks. Best chances for success would seem to rest on some type of acceptable compromise that would utilize a combined tax- and pay-as-you-ride financing scheme.

$251-Million Airports Bill

A four-year $251,500,000 program of airport construction and improvement for the 48 states, the Territories of Alaska and Hawaii and in Puerto Rico and the Virgin Islands has been approved by the 84th Congress in S. 1855. Passage of the bill climaxes more than three months of intense legislative activity by sponsors and supporters headed by the Airport Sponsors Committee of the American Municipal Association.

For fiscal 1956, the bill authorizes execution of grant agreements in the sum of $40 million with respect to projects in the several states and $2.5 million for the territories and possessions. These amounts, combined with the $20 million cash appropriation in the 1956 Commerce Department appropriations for civil airports, make a total of $62.5 million for next year. For the following three fiscal years grant agreement authorization totals $63 million annually.

In addition to its primary purpose of providing funds for a more adequate airport program the legislation has four other secondary, but highly important purposes:

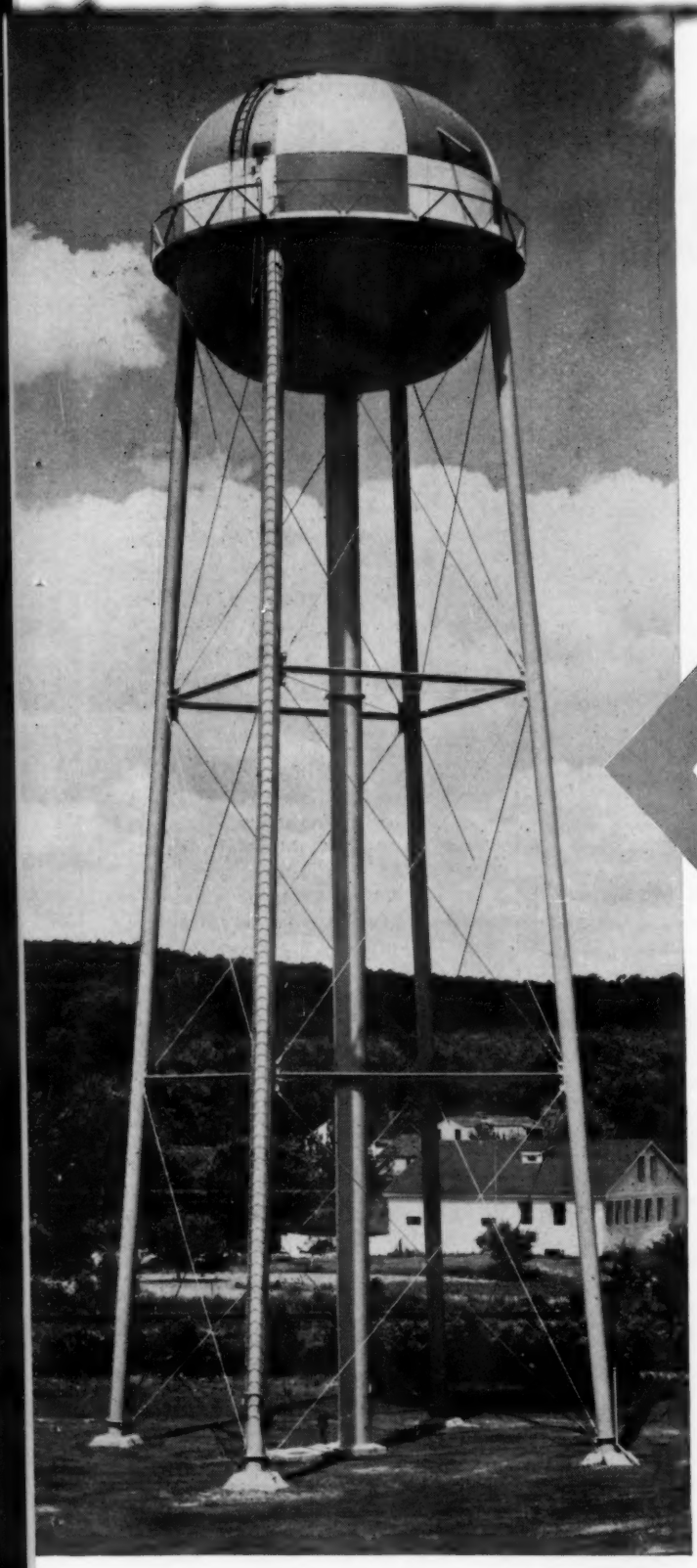
1. Makes it clear that the Department of Commerce is expected to make grants out of authorized funds for the development of any class of public airport, including the construction, alteration and repair of airport passenger or freight terminal buildings. The department is not to establish criteria limiting the eligibility of any airport project authorized by the Federal Airport Act of 1946.

2. Extends to two fiscal years the period of time within which apportioned funds shall remain available for use only in the states for which such apportionment is made. This provision is designed to give airport sponsors adequate time to prepare and submit plans and make provisions for financing the local share of costs.

3. Prescribes a deadline of March 31 for the preparation and adoption of each annual revision of the National Airport Plan.

4. Eliminates the present requirement that Commerce Department submit to Congress each year a list of proposed projects for development of large airports.

In anticipation of the bill being signed, CAA has already started to



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explore the administrative problems that will be presented in the stepped-up airport program. As was pointed out in testimony of a Commerce Department spokesman before the Senate committee, the first step will necessarily be a determination of criteria as to which airports, and "which part of which airports", will get priorities for federal aid.

Like Topsy the airport financing program "just growed" during the course of the session, starting out with an Administration budget request for $9 million in the Commerce Department appropriation bill. This was raised to $20 million before passage of the bill.

• • •

Data on the Shortage of Highway Engineers

Data reported by the states, the District of Columbia, Hawaii, and Puerto Rico for their 1954 programs show the total number of engineers employed in these highway departments is 18,034. The average distribution among areas of activity is about 6 percent in planning and traffic; 5 percent in location; 23 percent in road design; 8 percent in bridge design; 40 percent in construction; 7 percent in materials and testing; 6 percent in maintenance; and 5 percent in "other," which includes administration, contracts, estimates, right-of-way and, in some cases, trainees. About 67 percent of the highway departments are using consultants to some extent and that it would be necessary to employ 4,192 additional engineers added to the present shortage of 3,990 engineers, if consultants were not used.

Data reported by 141 cities, ranging in size from 50,000 to 500,000, show that the total number of engineers on the rolls in 1954 is 2,019. The average distribution among areas of activity is about 16 percent in planning and traffic; 28 percent in street design; 11 percent in bridge design; 28 percent in construction; 4 percent in maintenance; and 7 percent in other categories. The present shortage of engineers in the 141 cities total 845. About 65 percent of the cities used consultants in 1954 and it would be necessary to employ 542 additional engineers, about 27 percent increase over those now on the rolls, if consultants were not used. The above information was taken from the Highway Research Board Bulletin on "Manpower Needs in Highway Engineering."

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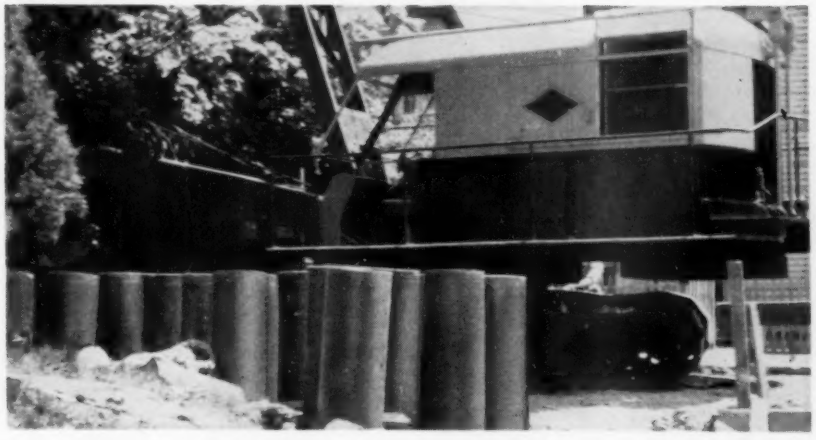

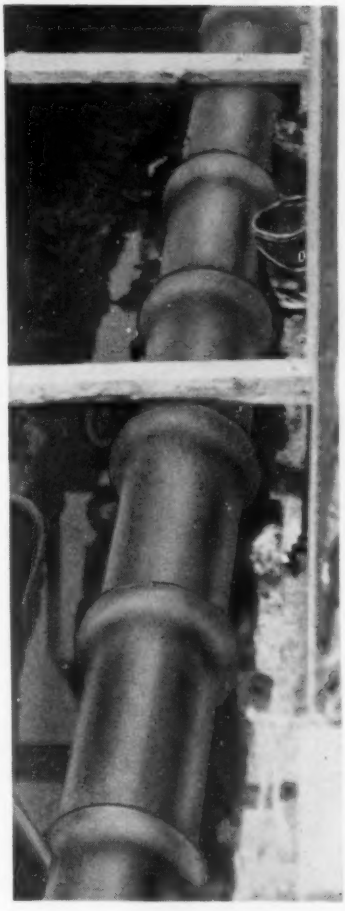

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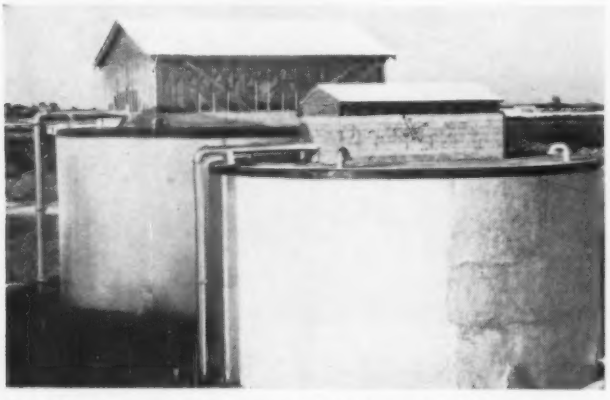
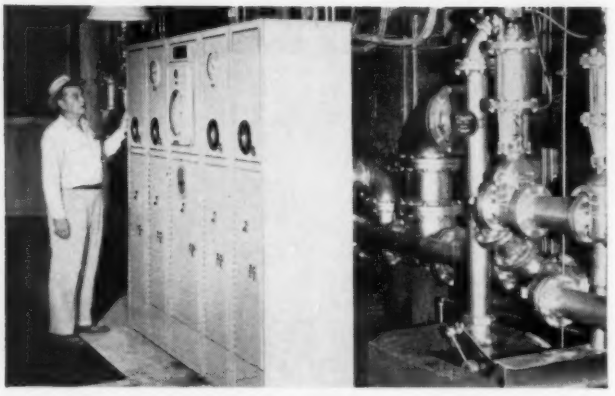


2. To prevent marine growths which would foul equipment, the sea water is aerated and chlorinated.

3. Sea water then passes through Permutit pressure filters (left) and is ready for regenerating the Permutit softeners (right). Sea water pumpage is kept to a minimum because high-capacity Permutit Q, used in the softeners, requires less salt for regeneration.



4. City Engineer George A. Gieseke inspects the Permutit control panel. It backwashes, regenerates and rinses the 4 newest softeners and places them on the line . . . *all without aid from the plant operator!* Two men per shift operate the entire water plant.

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Investigation of Travel of Pollution

ARTIFICIAL recharge of aquifers with reclaimed sewage and other waste waters has been recognized as one of the potential means of solving the growing problem of ground water overdraft in many areas of California. One of the reasons that replenishment of ground water basins by injection of reclaimed waste waters has not been practiced more extensively is that technical knowledge has been needed on the travel of pollution with ground water movement and on the practicability of injecting into an aquifer water containing organic and inorganic solids.

As a part of its research program in the field of waste water reclamation and utilization, the California State Water Pollution Control Board in 1951 contracted with the University of California, Berkeley, for a field investigation to obtain information on (1) the extent and rate of travel of pollution with ground water flow and (2) the use and methods of operating recharge wells as a means of waste water disposal and ground water replenishment. The research was directed by Professor Harold B. Gotaas, Director, Sanitary Engineering Research Laboratory. P. H. McGauhey, Assistant Director, and Ray Krone, Soil Scientist, conducted the experimental work.

This investigation was conducted at the University's Engineering Field Station on the northeast shore of San Francisco Bay. For the purpose of the studies, a well field was constructed consisting of a 12-inch recharge well surrounded ultimately by 23 six-inch observation wells. During 1951 and 1952, pertinent characteristics of the test aquifer were studied. In 1953 and 1954, travel of bacterial and organic pollution was observed by injecting sewage treated in varying degrees. At the same time, problems of operation and redevelopment of pressure wells were investigated.

The final report on these studies has been issued as State Board Publication No. 11, "Report on the Investigation of Travel of Pollution." Some of the principal findings in this report are briefly:

1. Bacteria travel rapidly at the start of recharge, reaching some maximum distance at rates governed by the induced ground water velocity. In the investigation, this maximum distance was found to be about 100 feet in the direction of normal ground water movement and

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some 60 feet in other directions.

2. Removal of bacteria with distance of travel is extremely rapid and the rate of such removal depends on the aquifer characteristics and does not increase at higher rates of recharge.

3. Clogging of the aquifer face by an organic mat takes place in direct proportion to the amount of suspended solids and organic matter. This mat filters out bacteria so that a decrease in bacterial numbers occurs out in the aquifer.

4. Clogging of the aquifer increases the pressure necessary to inject sewage, but it was found that such clogging (of the well under investigation) could be successfully removed by injecting chlorine, then pumping out the well at twice the injection rate. Pumping without the use of chlorine was not successful. About four percent of the injected water was pumped out during redevelopment. Injection rates used for sewage equaled the best previously reported for recharge with fresh water—about 8.4 gallons per minute per foot of aquifer.

A limited number of copies of this 218-page report are available upon request to the State Water Pollution Control Board, Room 610, 721 Capitol Avenue, Sacramento 14, California.

Giving the Birds the Bird

Wisconsin Municipalities Lists A Roundup Of Ways To Get Rid Of Pigeons and Starlings

PIGEONS and starlings apparently feel there's an open season on public buildings. This in itself may not cause a major municipal headache. But add to it a few property owners' complaints against these noisy nuisances, plus the complaints of car owners against their "antisocial" habits, and there are reasons enough why some officials have tried to give these ill-mannered birds the bird.

Dozens of methods have been used by cities throughout the U. S. to get rid of pigeons and starlings, apparently none of them very successful. But the methods used are interesting, if not informative. Some of them are summarized below.

Pigeon Traps—Perhaps the oldest methods used to get rid of pigeons is to use traps. Not too long ago a large midwestern city spent considerable funds to hire pigeon trappers to rid their public buildings of these disfiguring birds. Under the agreement, the trapper was to remove the pigeons to a distance of not less than 50 miles from the city. Although not of the homing pigeon variety, these pigeons had some homing instinct for within a month or two they were right back where they had been caught.

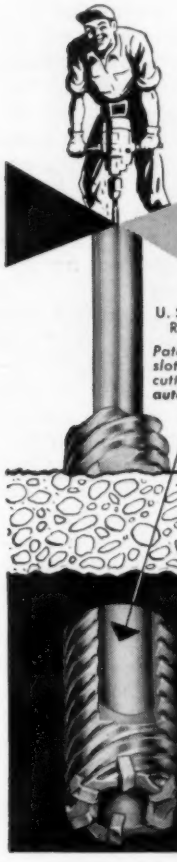
Distress Calls — Probably the newest method used in the attempt to get rid of starlings is to record a starling's "distress call." Not too long ago zoologists from a Pennsylvania college recorded the squawk of a scared starling on a tape and made an hour long recording of it. They then amplified the sound up to 120 decibels and aimed it into starling-filled trees. The birds flew away, presumably because the distress call of one bird meant danger ahead for all.

Cincinnati, Ohio, has tried the same technique. They put a loud speaker on a truck and blared the distress call through the downtown area for 2½ hours. There was no mass bird exodus. Apparently the starlings have to hear the cries a number of times before they get the idea they ought to leave town.

A rather unique approach is to gin-spike some mash and place it near favorite roosting places. It is reported that the birds get so drunk they fall from their perches and can be picked up and either killed or taken out into the country. No doubt whiskey would work as well.

A few critics have attempted to use fake owls to scare away birds. However, the results seems to be that the owl statues simply become very desirable roosts. In fact, the birds don't seem "to give a hoot." Although imitation snakes placed on window ledges and other roosting places have a temporary effect, the birds, never to be outwitted, soon become aware that the snake is only an imitation.

Hot-Foot Approach — Albany, New York, once attempted to "shock" the birds out of their roosts by giving them an electric hot foot. An electronic pigeon evictor, consisting of three parallel wires laid along flat surfaces where the birds roost, was installed and every three seconds an electric impulse was sent through the wires. The impulse was not strong enough to kill the birds but uncomfortable enough to make them move on.



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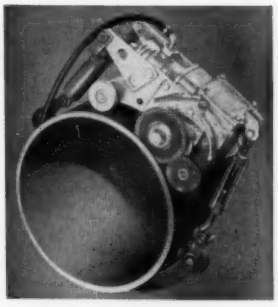

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Another company sells a special paste to be applied to roosting places which stings the feet of birds enough to make them leave.

Another method used to reduce the nuisance caused by nonmigratory starlings and pigeons is to install strips of steel with spikes a short distance apart on buildings. It has been found that the starlings are properly impressed and leave, but the pigeons often make a good thing of it and build sturdier nests in between or back of the spikes.

"Pigeon slides" have been used in St. Louis, Missouri, to keep birds off the city hall. The slides are pieces of metal placed at angles so that the pigeons slip off when trying to land.

In Newton, Massachusetts, the city forester has effectively removed pigeons which infested the city hall by using his high-pressure tree sprayer. After the roosting birds had settled for the night, the forester blew them off the roost by using blasts of air from his spraying rig.

The city of Detroit has used high-pitched whistles to get rid of starlings. Loud speakers emitting 10,000 to 11,000 cycle whistles have been set up near trees in which the starlings roost. At this frequency the whistles can be heard by the birds, but apparently not by the human ear, and it drives them away from their perch. Some New Jersey communities have used imitation owl hoots from an electric recorder in connection with an imitation owl, although this does not appear to affect starlings.

The Water Cure—The water cure for pigeons and starlings has also been used. At one time Poughkeepsie, New York, had city firemen with hoses posted in the streets in the evening and after the birds had roosted the firemen drove them out with water under pressure. The birds returned after the first and second application but did not return after the third. Apparently the treatment must be given in a third degree manner.

Some Michigan cities have attempted to eliminate excessive starlings and sparrows in their cities by the application of gas. The cities claim that the birds were successfully destroyed. The work was done by a private company which retained the formula used in developing the gas.

Shotgun Cure—Another common method used by some cities is simply to declare open season on undesirable birds. A special "BB" shot is available for shot guns which will either kill or frighten birds but will not be likely to break windows or endanger human lives. Cincinnati recently tried the "shotgun cure" under the auspices of the police department with the city furnishing the ammunition. About 2,000 starlings were reported to have bit the dust.

• • •

Sanitary Engineers to be Listed by PHS

A national register of sanitary engineers is being developed by the Public Health Service at the request of the Office of Defense Mobilization. Such a register was first developed by Sanitary Corps officers during the war; in 1949, the American Public Health Association prepared a nation-wide roster. A new start must now be made. Mailings will soon be made, consisting of a letter and an information sheet which the recipient is requested to fill in and return. All professional societies with which sanitary engineers are affiliated are cooperating in this project.

"20% MORE ROADS . . . . *without increasing the budget*"

Pinellas County, Florida, had a difficult road building and maintenance problem. (For particulars read Mr. C. A. Peterson's article, "New Methods Ease Florida Road Cost Problem," in this issue of PUBLIC WORKS).

Fast-increasing population and tourist traffic created an ever-increasing demand for new roads, repairs and rebuilding. At the same time, increased freight rates threatened to cut the road building budget in half. How Pinellas County is meeting this problem and building 20% more roadways without increasing the budget, makes a story every highway official and contractor should read. As Mr. Peterson says: "We do not have our road problems whipped, but we do have them slightly groggy."

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Finger-tip operation	X	–	–	–	–
Fully automatic safety door	X	–	X	–	–
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100% clearing of material jams on the job	X	–	–	–	–
Body floor free of ramps and wheel housings	X	–	–	–	X
Tapered body	X	X	X	X	–
Batch-type loading	X	X	X	–	X
Shortest body length	X	–	–	–	–
No retainer plate	X	–	X	X	–
One underbody hoist	X	X	–	–	–
Tailgate free of hydraulic hoses, pipes and valves	X	–	–	–	–
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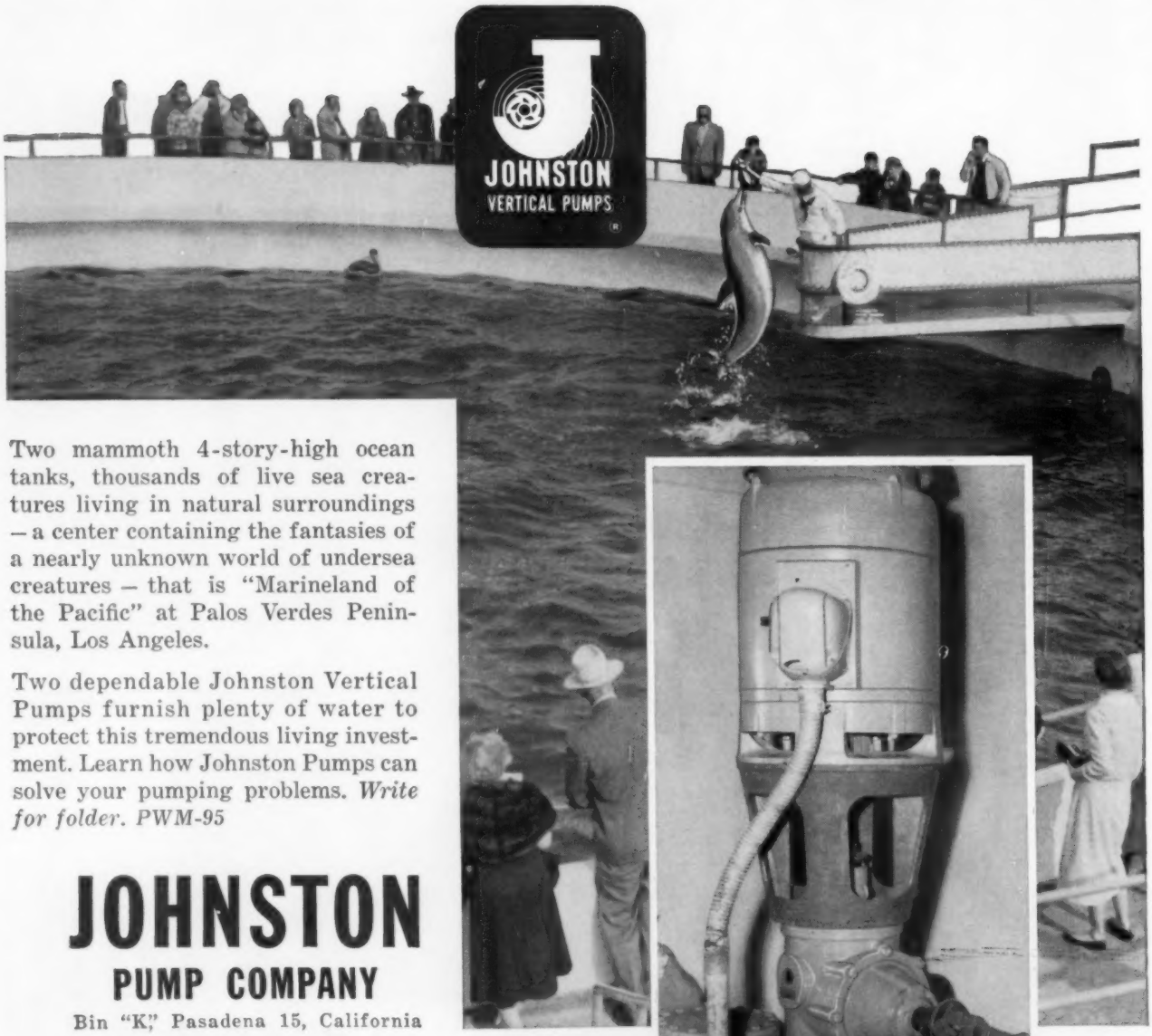

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BOOKS IN BRIEF

PIPE FRICTION MANUAL

This Manual features a section demonstrating the mathematical calculations used in the construction of charts. This is supplemented by complete tables of friction loss for water in feet per one hundred feet of pipe. Wrought iron, steel and cast iron pipe sizes from ⅛-inch nominal to 84-inch I.D., are covered. Also included are tables of resistance coefficients for valves and fittings, 90 degree bends, diffusers, and others. The tables of resistance coefficients for valves and fittings include the latest available experimental data and show the values in more detail with respect to size and type than has heretofore been published. There are full page charts showing the friction loss for the incompressible flow of viscous fluids for pipe sizes from ½ inch through 12 inches and three fold-in charts of friction factors to permit the calculation of the friction loss for any fluid (liquid or gas) in any size or shape of conduit. Of particular value are numerous examples showing actual mathematical solutions to pipe friction problems. Price $1.75 domestic; $1.85 foreign. Copies from the Hydraulic Institute, 122 E. 42nd St., New York 17, N. Y.

WATER TREATMENT HANDBOOK

This is the first English edition, after two French editions, of a complete and useful text on water treatment. The first chapter is "The Chemistry of Water" and the average reader—and probably the expert, too—will find a great deal of value here. Thereafter, there are chapters on coagulation, settling and clarifying, filtration, sterilization, iron and manganese removal, softening and ion exchange, treatment of boiler feed water, etc. There is much useful reference data. 451 pages, well illustrated; distributed by H. K. Elliott, 20 Harrington Court, London, SW7, England. $7.50.

VEHICLE CLIMBING LANES

This bulletin contains three research reports on the above subject: "Simplified Climbing-Lane Theory and Road-Test Results," by T. S. Huff and F. H. Scrivner; "Motor-Vehicle Performance on Ascending Grades," by Robert E. Dunn; "Truck Congestion on Uphill Grades," by William E. Willey. 33 pages; price 60¢. Request Bulletin 104 from Highway Research Board, 2101 Constitution, Washington 25, D. C.

STABILIZATION OF SOILS

Bulletin 98 contains three papers pertaining to Stabilization of Soil presented at the Thirty-Third Annual Meeting of the Highway Research Board. "Effect of Petrographic Variations of Southwestern Iowa Loess on Stabilization with Portland Cement" by R. L. Handy, D. T. Davidson and T. Y. Chu; "Stabilization of Bank Run Gravel by Calcium Chloride" by Floyd O. Slate and A. S. Yalcin; and "Strength of Soil-Cement as a Function of Degree of Mixing" by Clyde N. Baker, Jr. Price 75¢; 52 pages. Request Publication 346 from Highway Research Board, 2101 Constitution Ave., Washington, D. C.

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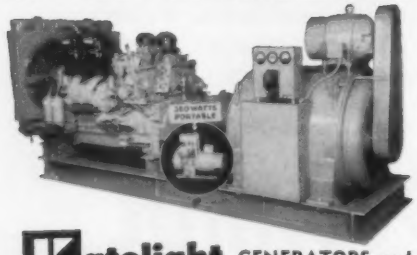

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TREATMENT OF AUCKLAND MEAT WASTES

(Condensation of a report prepared for the Auckland, New Zealand, Metropolitan Drainage Board by the Chief Chemist, R. Hicks, A.R.I.C., F.I. San. I., F. Inst. S., May, 1954)

IN order to study the problem of overcoming harbor pollution by various industries, principally meat packing, in the Westfield area of the Auckland Metropolitan District, two pilot plants were constructed. One of these, in the Otahuhu district, afforded conventional type treatment involving flocculation, sedimentation, filtration, and/or activated sludge. The other, located at the Southdown Works of one of the meat companies and constructed with the cost shared by local industries, was used to determine the feasibility of anaerobic digestion as a pretreatment stage followed by a trickling filter and oxidation pond. A further set of investigations combined the two plants by conveyance of the digested effluent from the Southdown plant to the Otahuhu plant. The investigations covered a period of two to three years.

The volume of wastes varies from 3 to 4½ million gallons per day, most of it being discharged between the hours of 6:00 AM and 6:00 PM and over a 5-day week. The animals slaughtered included cattle, sheep, lambs, calves, and pigs. Considering cattle as three hog units per animal; sheep, one and one-half; lambs, one; and calves, one-half; the total hog units of animals slaughtered in a year were approximately 3,200,000. The variation in discharge of the wastes was 100,000 gallons per hour to 360,000 gallons per hour under winter conditions and 10,000 gallons per hour to nearly 400,000 in the summer. The 5-day BOD of the wastes ranged from 1,000 to 4,000 ppm. The fact that the animals were fed the year around from grass influenced the interpretation of the analytical results of the study.

At the Otahuhu pilot plant conveyance of the wastes to the plant was by means of a tank wagon which had a working-day capacity of 6,000 gallons. Pumps selected were of such capacity that they could deliver a rate of feed to the plant, if necessary, equal to the rate of cartage from the meat works. The raw wastes were fed to the treatment plant during the regular working period of the meat works, and arrangements were made for recirculation at times corresponding to the non-operating periods of the packing industries. The capacities of the various units follow: Collecting tank 13,850 gallons; flocculating tank 310 gals.; primary settling tank 1,600 gals.; primary filter (34.8 cu. yds.) 5,866 gals.; intermediate settling (two tanks) total 1,410 gals.; activated sludge units (6) 5,730 gals.; secondary filter (15.5 cu. yds.) 2,606 gals.; final tank, 1,015 gals.

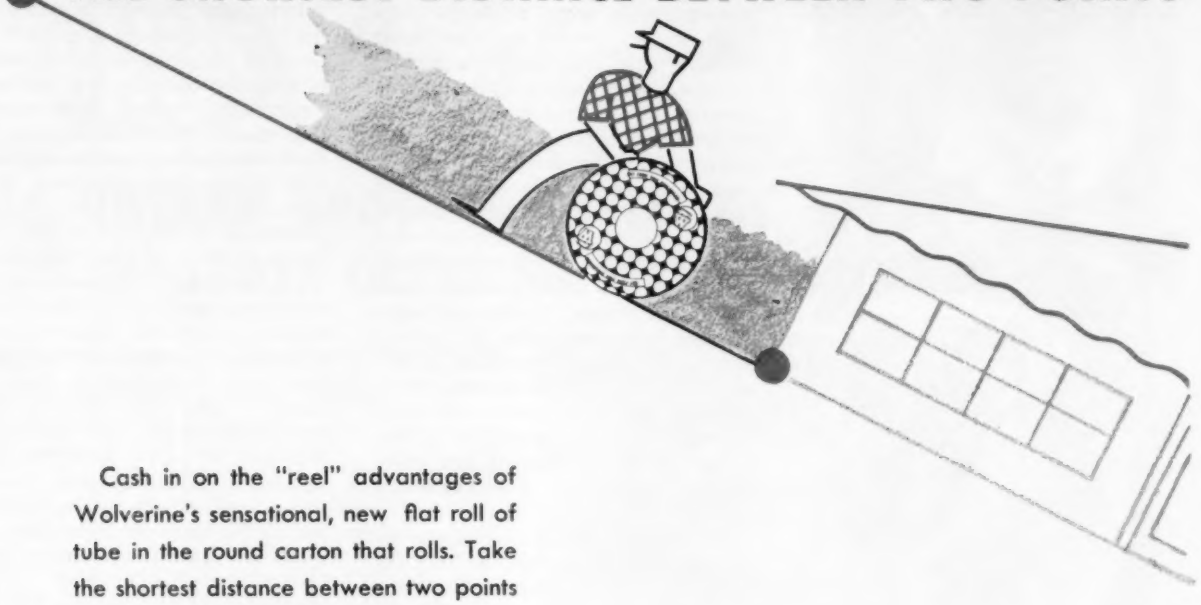
In assessing the purification results of the Otahuhu plant consideration must be given to the dilution factor resulting from all-night or all-weekend recirculation. Consequently, in all runs it was necessary to consider not only the average quality of all effluents discharged, but the quality of effluents at the commencement and end of the working day. Various combinations of the treatment units were tried. The most acceptable results accrued from utilizing a single stage high rate filter in combination with activated sludge treatment. It was concluded. however, that at least one stage ot high rate filtration following primary sedimentation tanks would produce stable effluents. If activated sludge is used following high rate filtration, provisions should be made for by-passing normal sludge return to avoid building up of solids and danger of sludge bulking.

Anaerobic Digestion

Preliminary laboratory work had indicated that anaerobic digestion of meat wastes might involve reduced treatment costs, especially if such digested effluents could be fully stabilized by further treatment in an oxidation pond. The preliminary results indicated the use of a retention period of two days at an operating temperature of 80° F would produce effluents of polluting strengths similar to those of domestic sewage. The Southdown pilot plant accordingly included a digestion unit involving a paddle stirring mechanism, grease trap, mixing and flocculation facilities, and primary sedimentation units. The capacities of the various units are: Digester units (grease trap, mixing and flocculation, and primary sedimentation 93,200 gallons; secondary settling tank 4,700 gals.; trickling filter (2.37 cu. yds.); oxidation pond (10,500 sq. ft., 2 ft. 2 in. deep) 140,000 gals.

Provisions were made for recirculation of sludge in the digester with an attempt to control solids content in the return, as in activated

THE SHORTEST DISTANCE BETWEEN TWO POINTS



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sludge. As with the Otahuhu plant, arrangements were made to feed raw wastes over an eight-hour working day. However, the wastes utilized were pumped from a nearby channel. Consideration was given to the question of building up sufficient active digesting sludge to form a seed for anaerobic digestion. It was found that the use of digested sewage sludge could be recommended as a starter. To overcome difficulties of sludge rising and the gas-locking of pumps, it was necessary to install a degasifier to permit separation of sludge from mixed liquor in the sedimentation tank. This has not been wholly successful because of the disintegration of floc occurring in the pumping and other processes incidental to the degasifier operation.

Throughout the period of operation attempts were made to hold the temperature of digestion between 75° and 85° F., the anticipated operating temperature in a full-scale plant. An effort was also made to maintain a solids content in the return sludge of 16,000 to 20,000 ppm. It is believed that the factors of temperature and solids concentration are important, but it was possible to evaluate them.

As far as gas production is concerned, the proportion of carbon dioxide was 20-25 percent in the early stages of digestion, dropping off to 10-15 percent later. The methane concentration remained constant at 70-75 percent. Relating volume to losses in volatile solids was not possible.

In the operation of the trickling filter, it was noted that continuous operation would require special provisions to overcome the problem of maintaining efficiency during periods of non-operation of the industry. Intermittent use was investigated, however. The presence of solids in the influent much of the time interfered with observations on this phase of the study. The carry-over of solids also caused problems in the oxidation pond. After it was solved and the pond cleaned out, evidence was obtained that the use of oxidation ponds is practicable.

In reviewing the analytical data it became obvious that their relation to effluent quality is not as simple as with domestic sewage. This matter was the subject of much discussion among members of an advisory committee composed of chemists from the various industries concerned. They found most fault with the application of the 5-day BOD test. Where meat wastes are involved, nitrite production with accompanying increase in oxygen demand occurs before a suitable lowering of the demand from oxidation of carbonaceous matter is obtained. Frequently, also, non-reproducible results are obtained, apparently from incubating samples containing high nitrite concentrations. A further objection to the test is the complications arising from photosynthetic activity of chlorophyll-bearing organisms. It is customary to incubate samples in the dark, yet the natural conditions observed under controlled conditions in the laboratory are subjected to this "unnatural" limitation. The committee concluded that the albuminoid nitrogen and the relative stability tests were of more value in this case and that the BOD test should be used in connection with oxidation ponds, but only if the test is carried out under "natural" conditions of incubation. The term "natural" indicates subjecting the incubated sample to the same conditions of light and dark as would occur naturally.

A study of the conditions in the Manukau Harbor showed that deposits of organic solids in mud flats were responsible for nuisances at low tide. In spite of the heavy pollutional load being discharged, however, a high degree of self-purification was being effected, with notably low counts of coliform organisms being observed. It is believed that the action of photosynthesis is responsible for this and also exerts some bacteriostatic influence.

It was concluded that reducing the characteristics of the wastes to those comparable with domestic sewage would be feasible by application of the digestion process, and that further refinements, if desired by pollution control authorities, could be obtained by use of the conventional processes.

• • •

Costs of Maintaining and Operating Public Buildings

Cost of maintaining and operating the 61 public buildings under the jurisdiction of the New York City Department of Public Works for the fiscal year 1953-1954 is 81.5¢ per sq. ft. and is broken down per sq. ft. as follows: Supervision 4.7¢; watchman service 2.2¢; cleaning 35.9¢; heating and cleaning 15.7¢; elevator operation 10.1¢; elevator maintenance 2.8¢; electrical maintenance 2.3¢; structural maintenance and alteration 3.1¢; painting 1.5¢; plumbing 1.6¢; general operation 1.3¢ and equipment furnishings 0.3¢.

BROS *tip sheet* EXTRA

BROS ROTARY SNOW PLOW LOADS 5-YARD TRUCK IN 30 SECONDS; CASTS 50 FEET IN ANY DIRECTION

MOUNTS ON INDUSTRIAL TYPE TRACTOR LOADERS, GRADERS AND JEEPS

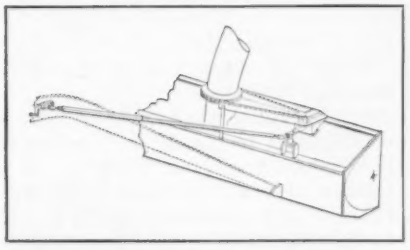
SNOW BELT, U.S.A. The big news in this part of the country is single lane loading of windrowed snow with the Bros Series "A" Sno-Flyr. This powerful rotary snow plow loads a 5-yard truck in less than 30 seconds — or where convenient — tosses tons of snow up to 50 feet away.

That's really getting snow off the streets fast and it's done without snarling traffic; the Sno-Flyr's casting chute is rotated directly forward to load truck straddling windrowed snow. The whole operation is performed up to 10 times faster than by bucket loader and without jockeying back and forth for loading position.

Heavy, wet snow is hurled by the ton into waiting line of trucks on Luverne, Minnesota's Main Street. Normal traffic is quickly resumed after heavy March snow fall. Bros Series "A" is mounted on Ford Major tractor with Wagner loader. Dozens of snow belt cities report enthusiastic approval of this plow's great performance.

MOUNTS ON MOST INDUSTRIAL-TYPE TRACTORS

The Bros Series "A" mounts on almost all front-end hydraulic bucket loader attachments with 1,000 lb. capacity. It is easily installed by the same bucket pin connections. Hydraulic lift arms permit plow to knock down drifts up to 10 feet high, chewing them down layer by layer. No other comparable rotary can work on deep drifts so effectively.



BALL BEARING MOUNTED CASTING CHUTE

Ball bearing mounted casting chute is turned from the tractor cab, providing you with directional control of snow ejection through 180 degree arc. Positive control for "spot casting" in confined areas.

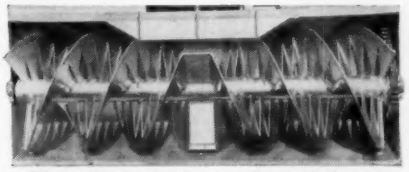
The Series "A" Sno-Flyr's segmented "finger joint" chute capper permits you to adjust height of snow stream, just like crooking your finger. And an optional longer chute which is interchangeable with capper is available for loading trucks.

BROS SLIT-SPIRAL ROTOR-FEED RAKE

A close look at the Series "A" slit-spiral rotor-feed rake shows you the world famous Bros Sno-Flyr design. It rapidly gorges wet, heavy and chunky snow as well as fresh fallen snow; small stones and street debris do not hamper its operation.

The non-clogging rotor-rake feeds the snow to casting chute, as rapidly as moldboard area fills, hurling it up and out.

Rotor's cutting height is 30 inches. Oscillating type runners provide ground contact.

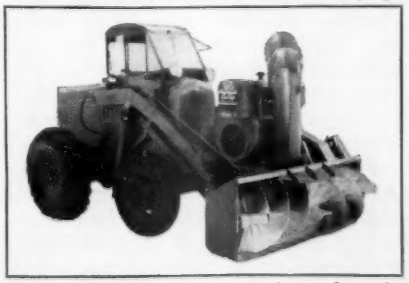


The unique knifing action of the slits prevents packing of snow around the rotor hub; snow is moved up to 7 tons per minute in a constant, even discharge.

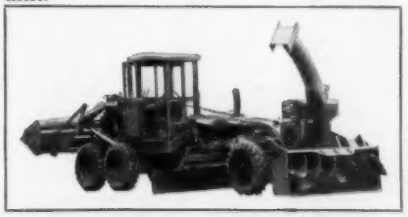
Three plowing widths are available: 4′ 4″, 5′ 6″, and 6′ 6″. With only a 30 hp engine, the Series "A" performs the work of much bigger units and with equal efficiency.

MOUNTS ON OTHER TYPES OF EQUIPMENT

Besides mounting on most industrial type tractors, the Bros Series "A" Sno-Flyr mounts on popular makes of self-contained front-end loaders. Such equipment is thus kept on a year 'round working schedule.

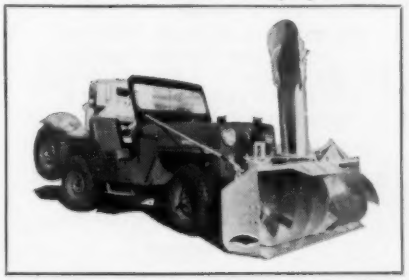


Road patrol graders and crawler tractors, too, use the powerful Bros Series "A". Hydraulic arms for scarifier on grader are used to attach snow plow unit.



FOR 4-WHEEL DRIVE JEEPS

A special undercarriage push frame and hydraulic lift are used to mount the Series "A" on 4-wheel drive jeeps. Plow's



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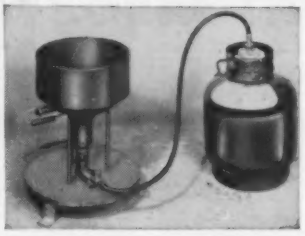

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Waste Disposal at Air Force Stations

MAJOR RALPH F. THOMPSON
Sanitary Engineer, Office of the Surgeon General, Headquarters, U. S. A. F.

LT. JOSEPH F. LAGNESE
Air Force Liaison Officer, Robert A. Taft Sanitary Engineering Center, U. S. P. H. S.

ROBERT J. HANSON
Sanitary Engineer, Installations Division Headquarters Air Material Command, U. S. A. F.

This is an abstract of a paper read by Major Thompson at the recent Texas Water and Sewage Works Association Short School.

In providing for waste disposal at the many Air Force installations in this country, practically all types and designs of treatment methods are being utilized. The determination of these treatment methods is usually dependent on two main considerations. The first is the protection of the health of the command and the prevention of injury to the property of riparian owners. The other main consideration is the requirements of local stream pollution abatement authorities.

By regulation the responsibility for construction and operation of waste treatment facilities is placed with the Installations Engineer organization of the Air Force, while the responsibility for assuring proper environmental sanitary conditions at treatment works, sewer systems and receiving watercourses is vested with the Surgeon. These organizations work together somewhat the same as a municipal Superintendent of Sewage Treatment and a State Health Department. The sanitary engineering and industrial hygiene staffs of the major air commands lend technical assistance to the individual Air Force base personnel in solving unusual and difficult problems encountered in waste disposal. Similar professional staffs of Headquarters USAF provide guidance and establish policies for The Air Force in regard to the operation of sewage and industrial waste works.

Regulations also establish that the Air Force shall make a continuous study of water pollution under the provisions of Public Law 845 and Executive Order 10014; provide for inspection of sewage works by State Health Departments; direct that full cooperation be given State and local health authorities by Air Force agencies; and vest the approval of chlorination of sewage with the major air command to prohibit the misuse of chlorine for correction of poor operating practices.

Although the methods of treatment for domestic sewage are similar to those employed by municipalities, the design and operation of such Air Force facilities may be, to varying extent, different from municipal practices because of certain characteristics peculiar to military sewage. These differences stem mainly from the military regime—the systematized pattern of sleeping, working and eating.

In most cases, a larger and more rapid variation in daily flow can be expected at Air Force bases. In general, the flow distribution reflects promptly the sequency of base routine affecting water consumption. Such conditions necessitate the use of much higher than average flow for the design of most of the plant's elements. In estimating average sewage flows, 100 gpcd is used for resident personnel and 30 gpcd for nonresident personnel. The design capacity is computed from the authorized population of the base times a capacity factor. These capacity factors range from 1.5 for authorized populations of 5,000 to 1.0 for populations of 50,000.

With the exception of the Air Materiel Command, which will be discussed later, the industrial waste contribution to the domestic sewage flow is practically nil. With the detention time in the sewers being low because of the nearness of the plant to a usually compact community area, the sewage as it arrives at the plant can be expected to be relatively fresh and in a condition amenable to biological treatment. Military sewage is generally conceded to be more concentrated, also, because of the greater organic waste per capita from a predominantly male population fed on a high caloric diet. However, during weekends and other off-duty periods, organic and hydraulic loadings usually decrease substantially, with only a small operational and resident group combined with certain continuous industrial demands contributing to the waste flow.

Because of the type and extent of fluctuation experienced, the majority of secondary treatment plants in use at the air bases are trickling filter units. Other treatment methods in use are activated sludge, contact aeration, Imhoff tanks, oxida-

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tion ponds, septic tanks and combinations and modifications of these methods. In some instances, the air base will contract with a nearby municipality to treat and dispose of its wastes.

In the ZI, latest estimates indicate that 78 percent of the air bases are treating their sewage; 20 percent of the bases are contracting with nearby municipalities to treat their wastes; and only 2 percent of the bases are discharging untreated wastes into the streams.

It is understandable that the characteristic of sewage from one Air Force Base not only differs from a nearby municipal sewage, but can also be very much different than another base's sewage, since the missions of the various commands, such as ATC, SAC, ADC, TAC, are so different. For example, ATC bases are usually quite large and consist of a high percentage of transient military personnel, whereas an AMC base is very industrialized and has a high proportion of civilian workers.

In general, the Air Force utilized the design criteria of the Army Corps of Engineers as given in the Military Construction Engineer Manual. Briefly the more important criteria factors are as follows: Average sewage flow is assumed to be 100 gpcd with the design flow being the average flow times a peak flow factor of 3.7 for 5000 population or less to 3.1 for 20,000 population or more. In addition a future capacity factor of 1.5 for 5000 population to 1.15 for 20,000 population is employed. A minimum size of 6-in. sewer pipe house connection and 8-in. for all other connections is specified. The specified minimum horizontal distance between water and sewer lines, except where lines are at a higher elevation, is 10 feet. In the absence of specific State and local health codes, primary treatment will generally be provided where the dry weather stream flow is less than 4 cfs per 1000 population served or where the stream dilution ratio is less than 25 to 1 whichever is greater. The provision for secondary treatment is entirely dependent on local conditions as specified by State health authorities. Standard rate trickling filters are generally recommended for secondary treatment and are designed for 600 pounds BOD/acre ft./day loading for 80 percent BOD removal. High rate trickling filters, where utilized, depending on local economics are designed for an average loading of 3000 lbs. BOD/acre ft./day and a recirculation ratio of 1.5 to 1 for a BOD reduction of 75 percent. Two-

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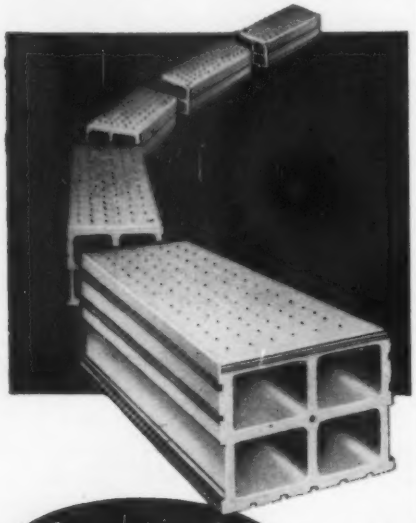

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Operation

Operation of Air Force waste treatment facilities is largely accomplished by civilian personnel. Military personnel are utilized at remotely located installations and at some bases as on-the-job trainees. Civil Service qualification standards which must be fulfilled by applicants are somewhat analogous to the certification program used by some states. The turnover of sewage plant personnel is believed lower than in municipal systems which contributes to stability of operation. Standard operating procedures are provided in the form of Air Force Technical Orders; however, these are merely guides and are not expected to answer all the varied problems arising in sewage treatment. Sewage plant personnel are encouraged to attend training courses sponsored by State and Federal Health Services, and to join professional societies, as a means of improving their knowledge of sewage treatment.

It is the belief of the Air Force that preventive maintenance of waste treatment works is of prime importance. Much emphasis has been placed on this in order to minimize "down-time" of equipment and to prevent discharge of untreated or partially treated sewage. Technical manuals are provided to sewage works personnel, containing detailed schedules for performing routine and major maintenance operations. Card files for each item of equipment are kept current, and serve both as a record of maintenance accomplished and as a reminder to the plant personnel of the operations to be performed. It is our opinion that the implementation of this program has greatly increased the average life of the facilities involved.

Very few bases in the Air Force have had a foaming problem of any intensity. This is due mostly to the absence of laundries at the majority of bases. In most cases, the bases contract for this laundry service with a larger centralized military installation, institutions such as Federal prisons, or with commercial laundries.

At some bases in the arid areas it is not possible to use potable water for general landscaping and erosion control irrigation. Many different schemes have been suggested for using base sewage effluent for this purpose. Because of the unknown health hazard factors involved, the Air Force Medical Service has been cautious in approving such projects. A current policy prescribes that all sewage irrigation projects must have Headquarters USAF approval and each case will be judged on its individual merits. To date, only one such project of any consequence has been approved. This is at a base in central New Mexico which requested approval of a project to use sewage effluent for irrigating trees and grass planted on the windward side of the base for erosion control. Upon granting approval, the Medical Service stipulated that the present primary treated sewage effluent must also have secondary treatment followed by chlorination. The base was allowed to accomplish secondary treatment by lagooning for a minimum of 30 days detention time. It was also stipulated that irrigation distribution pipe must be above ground and the treated effluent could not be distributed within inhabited areas.

The Air Force, being deployed world wide, provides sewerage facilities under a wide variety of geographical and climatic conditions. Not the least of these problems are those encountered in the Arctic. The sewerage facilities provided for our main bases in Greenland and Alaska are illustrative. Ladd AF Base in Alaska and Thule AF Base in Greenland, which is the most northern base, are comparable in size and operations to many bases in Texas, and have been provided with unique sewerage facilities. In Greenland where permanently frozen ground and extremely low temperatures make a buried pipe collection system impracticable, each group of living quarters is provided with a heated sewage collection tank which is pumped out periodically into tank trucks for disposal on the shelf ice near the base. Water for flushing bowls is obtained from waste bathing and laundry water collection tanks. All available water is provided by distillation and ice melting.

At the more southerly Ladd AF Base in Alaska, conditions have permitted the installation of a modern sewerage system. Ample water is available from multiple deep wells. All sewer lines are installed with water and steam lines in heated concrete conduits, called utilidors.

Some of the utilidors are large enough to permit maintenance men to walk through with head room left to spare. The base is also equipped with two primary treatment plants having a combined capacity of about 3.5 mgd. The effluent is disposed of in the Cheena River

above the city of Fairbanks. Each plant, including settling tanks, is completely inclosed in a heated building. Needless to say, minimum winter temperatures of —60°F create many maintenance problems not ordinarily encountered in temperate zones. Digested sludge is removed once a year during the short summer and is disposed of in the liquid state by means of tank trucks and is utilized for promoting grass growth along the runways.

Industrial Wastes

Typical of the industrial operations generating wastes at AMC bases are electroplating and metal processing; cleaning of parts, engines, and aircraft fusilages; carbon removal of engine parts; painting and depainting. The composition of these wastes will include varying amounts of such heavy metal salts as copper, cadmium, lead, zinc, etc.; toxic materials such as cyanides and chromates; free and emulsified oils; suspended solids; and taste and odor producing phenolic wastes.

Very little attention was given to the industrial waste problem prior to the enactment of Public Law 845, 80th Congress, and the issuance of Executive Order 10014. As a first step toward compliance with this legislation, it was decided to perform detailed surveys of all AMC installations in order to define the extent of the industrial waste problem. The surveys were performed by private consulting firms at some of the bases and by Air Force technical personnel at others.

Because of the imminent need for action to abate the possible pollution by industrial wastes, and realizing that several years would be required to obtain congressional authorization and funding for construction of treatment facilities, it was decided that major efforts would be expended toward elimination of wastes at the source. An expanded program of bulk collection and cartage of strong wastes such as contaminated oils, cleaning solutions and plating solutions, was achieved, and these wastes disposed of by batch treatment, burning, lagooning or evaporation. A vigorous program of water conservation was also instituted which has resulted in appreciable savings in pumping costs and water resources, with accompanying reductions in industrial waste flow volumes. Improved methods of rinsing and process changes have been obtained, although in many instances resistance of the shop operating agencies has prevented more thorough exploitation of this method of waste abate-

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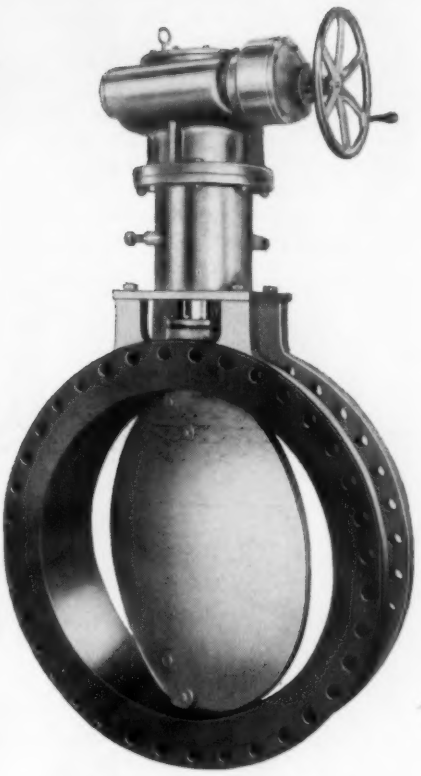

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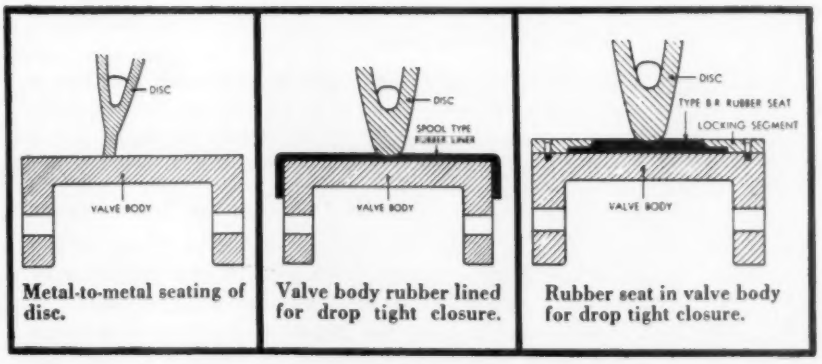

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ment. By use of the methods just mentioned, much has been accomplished to decrease the concentrations and volumes of industrial waste discharged from AMC installations.

Concurrently with the program of industrial waste abatement, engineering studies were made to obtain working estimates for inclusion of industrial waste treatment and collection projects in the Public Works programs. When preliminary approval of these projects was obtained, consulting engineering firms were employed to design the industrial waste systems. At the present time, construction of waste treatment facilities is under way at one Air Force base, and final plans and specifications have been completed for three other installations. The total cost of treatment facilities at these AMC bases will approximate one and a third million dollars. An additional $750,000 will be required for industrial waste facilities at other AMC installations, for which engineering design is anticipated in the near future.

In addition to the treatment plants under construction or planned, Kelly Air Force Base, San Antonio, Texas, has been operating an industrial waste treatment plant for some time. During the summer of 1952, the City of San Antonio started receiving the sanitary sewage from Kelly AF base which had formerly been treated on the base in a combination Hays contact aeration and trickling filter sewage plant. Upon completion of the sanitary sewage tie-in to the City system, the base sewage plant was modified for use as an industrial waste treatment plant. About 2 MGD of waste is treated daily in this plant, with excellent results obtained in removal of suspended solids and free and emulsified oils. Batch treatment of cyanide wastes is provided by means of alkaline chlorination, while waste acids are used in the plant to assist in pH adjustment necessary to break the oil emulsions. The effluent from this plant is clear and sparkling in appearance. Fish can be observed swimming in the final clarifier, which attests to the absence of toxic constituents. Because of the low turbidity and suspended solids content, plans are being prepared to utilize this effluent as cooling water for the engine test facility, and thereby relieve the base water supply of an appreciable loading.

Treatment methods at the various Air Force bases vary but may include two-stage treatment for removal of floating and suspended solids. Units combining gravity separation of free oil and settleable solids in waste equalization tanks are followed by pressure flotation to accomplish emulsified oil removal. Batch treatment of concentrated cyanide solution with caustic and chlorine, and neutralization of strongly acidic or alkaline wastes is utilized. Recovery of chromic acid and silver is accomplished by ion exchange methods, and it is anticipated that appreciable profit will result from recovery of these metals.

In order to obtain design and operating data for the treatment of our extensive phenol wastes, a pilot plant was constructed and put in operation at Tinker AF Base, the early part of 1953. Preliminary data received from this study indicate, for this particular waste, the feasibility of primary chemical treatment to break the emulsion and then dilution with the trickling filter influent sewage for final oxidation of the remaining phenols. Sufficient data have not yet been obtained to determine optimum and maximum loadings.

In the other commands of the Air Force, the wastes resulting from the

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cleaning of aircraft constitute the major problem. These wash wastes consist of kerosene, soaps, and other cleaning compounds and solvents strongly emulsified in water. The use of air flotation units to treat these wastes is being planned for many bases. The Air Force is currently sponsoring a research study at the Robert A. Taft Sanitary Engineering Center to evaluate and study other methods of treatment for these wastes.

Though the industrial waste problems at Air Force installations have been materially reduced, it is recognized that operating problems will occur in the future which will require a continuing exertion to insure that our responsibilities in the prevention of water pollution are fulfilled. It is anticipated that the major efforts in the future will be expanded in solving operational problems, and continuing to discover more efficient methods of treatment.

Research

Other similar research and developmental studies for waste treatment are being carried on by the Air Force. An interesting research program is currently being sponsored by the Aero-Medical Laboratories, Wright-Patterson AF Base, Ohio, on the inflight disposal of wastes aboard aircraft by incineration. An investigation of biological and chemical treatment of Air Force phenol type wastes is being contemplated for contract with a midwestern University in the near future. The Environmental Health Laboratory, Wright-Patterson AF Base, has recently carried on stream investigations in that area and, after completion of their new laboratories, plan to conduct more extensive stream studies as warranted. It should also be mentioned that the Sanitary Engineering and Environment Committee of the NRC has been most beneficial to the Air Force in advising and assisting with our specific problems in waste treatment.

• • •

Water Usage and Unaccounted-For Water

Of the total water produced by the Little Rock, Ark., Water Department in 1954, 88.04 percent was sold. Other uses of water included: Sewer Department 0.25 percent; filter wash water 2.34 percent; draining and cleaning catch basins 0.14 percent; other plant uses 0.36 percent; and unaccounted for 8.87 percent.

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• • •

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On the bayfront area of Corpus Christi, Texas, an area 100 feet square has been designated as a heliport under the direction of the manager of the city airport. An ordinance regulates the operation of the craft in the same way as other aircraft are controlled. No servicing or fueling facilities are permitted. Insurance is required.

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Laboratory Control Of Vacuum Filtration

In laboratory control of vacuum filtration, two methods are in common use—the Büchner funnel test and the filter leaf test. The former is preferred in the laboratory of the Chicago Sanitary District, the latter in the laboratory of the Los Angeles sewage treatment plant. Each of these methods has been modified by these laboratories, and is described in detail in this article. As ordinarily used, the Büchner funnel gives no information on comparative moistures in the cake, because of the loss of vacuum before a normal drying time may be applied. The authors describe a modification of the funnel which remedies this. At Los Angeles a filter leaf setup is employed which comprises a laboratory type vacuum pump, vacuum receiver and liquid receiver.

The authors state results of experiments made using these methods. Chicago reports that increasing ferric chloride dosages in the 5 to 10% range resulted in lower cake moisture. Los Angeles reports that little filtration occurs until the dose is about 3%; between 3 and 5%, almost linear increase of filter rate occurs; after 5%, there is a small increase until 6.5% is used, after which the rate gradually drops off. The moisture in the filter cake drops from an average of 75% at 3% ferric chloride to 73% at 5%. Other Chicago results reported include the following: Cake moisture increased directly as the thickness of the cake. Elutriating the sludge with tap water increased the filterability slightly and resulted in a little lower cake moisture than the unelutriated sludge. Contact time, or delayed filtration after dosing, up to 30 min. had no effect on cake moisture, nor had mixing of sludge after conditioning. Dacron cloth and filter paper gave the same cake moistures under the same filtering conditions. As the storage time of activated sludge before filtration was increased, the moisture in the cake increased when the same concentration of ferric chloride was used; increased quantities of ferric chloride were required to obtain the same moisture in the cake. Adjusting the pH of activated sludge with hydrochloric acid prior to ferric chloride treatment showed no saving in ferric chloride and no improvement in filtration time.

"A Method for Evaluating the Variables in Vacuum Filtration of Sludge." By A. M. Beck, E. N. Sakellariou and Max Kruk, San. Dist. of Chicago, and discussion by R. D. Bargman, Sewage Treat. Div., Los Angeles. *Sewage and Industrial Wastes*, June.

Commercialization Of Sewage Inventions

Most of the major process inventions being commercialized or commercially developed in the sanitary field today have been originated by consulting and municipal engineers and plant operators. However, manufacturers' employees are responsible for most, but not all, of the advances in mechanical equipment designs. The author gives advice to inventors who wish to patent and market their inventions, beginning with written and dated (and witnessed) records from the inception, through the development, to the patenting; how to make arrangements with manufacturers for handling the invention, or handling it himself (which requires considerable financial backing). A list is given of about 80 U. S. patents relating to the sewage treatment field issued within the past 25 years.

"Increased Income From Inventions." By A. J. Fischer, The Dorr Co. *Sewage and Industrial Wastes*, June.

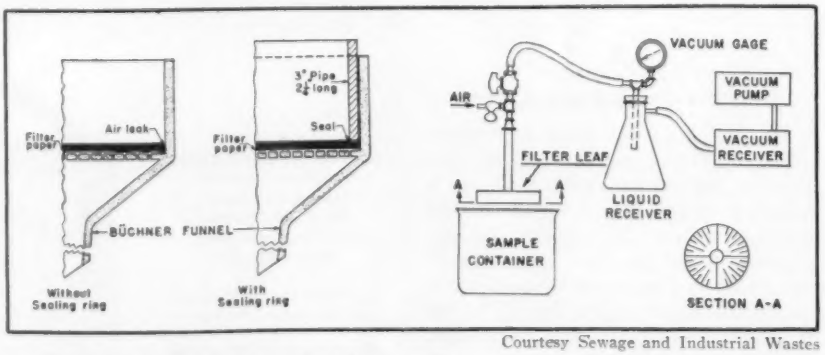
Gauging Industrial Wastes

Cincinnati, O., receives into its sewers the wastes from some 700 industries, for which service it makes surcharges based on waste strengths. For measuring the pH of each waste and preventing the discharge of toxic and otherwise objectionable wastes, the engineers have developed a trailer fitted with a pneumatic flow recorder, an electrically operated pH meter, and a pH recorder; a gasoline engine generator and an electrically driven air compressor; all fully automatic, and mounted on an army surplus, 2-wheel trailer. Air tubes and leads are of a length that permits placing the trailer 50 ft. from the sampling point.

"Industrial Waste Gauging Trailer." By Arthur D. Caster, Prin. Engr. of Sewage Disp. PUBLIC WORKS, August.

Maintaining Sewage Meters

Venturi-type meters used for measuring sewage under pressure should be provided with a pressure belt or tube at both main and



Courtesy Sewage and Industrial Wastes

● **BÜCHNER funnel with and without sealing ring, left; filter leaf setup right.**

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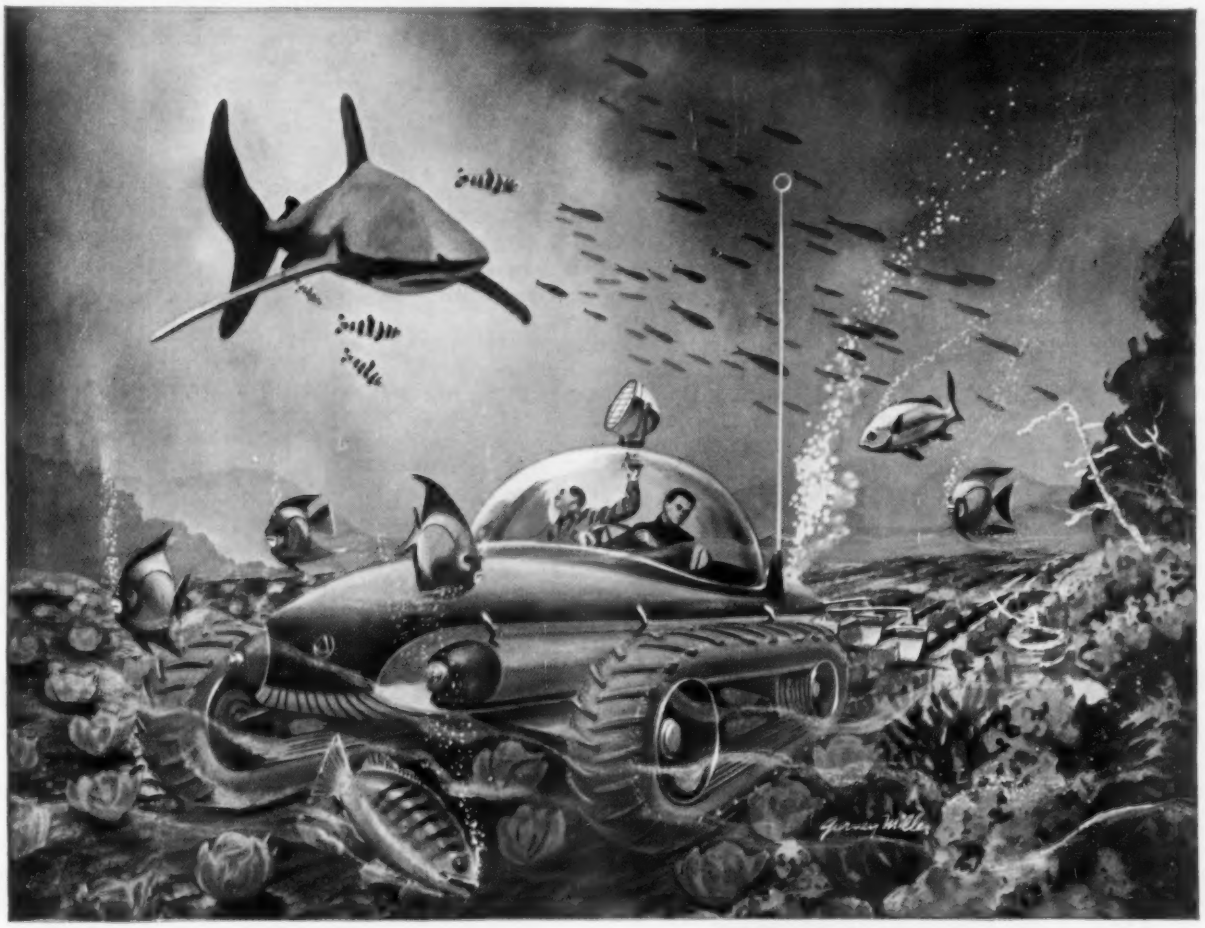

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throat diameters, each with cleaning valves. Where clear water under pressure is available, a continuous back purge of the pressure lines is desirable as minimizing the need for maintenance; but occasional reaming of the piezometer openings is still necessary. Periodic inspection of the meter itself is necessary. This should include correction of sediment in the meter cylinder; leaks or obstructions in pressure lines; air trapped in cylinder or in pressure lines; checking packing gland; oiling; calibration; and chart pen and ink.

In maintaining gravity flow meters, the chief necessity is keeping the transmission pipe, from the primary device to the float well, clean.

"Maintaining Sewage Metering Devices." By F. L. Sommer, Simplex Valve & Meter Co. *Water & Sewage Works*, June.

Heat Treatment Of Sludge at Luton England

Until recently, Luton has been treating the sludge from its plant, which uses the partial activated sludge treatment, by the Porteous heat treatment process, followed by filter pressing. The quantity and character of the liquor produced by the heat treatment was considered to impose such a load on the plant as to make it very difficult to produce the high-quality effluent desired. It was believed to be responsible for the high albuminoid ammonia content of the effluent, which was very resistant to biological oxidation processes. Therefore it was decided that the heat treatment should be replaced with a conventional digestion plant. Temporarily, heat treatment was discontinued, and lime and ferrous sulfate used, followed by filter pressing. This greatly improved the effluent but increased the amount of sludge to be pressed. The strength of the tank effluent was reduced by an amount equivalent to 40% of the load on the percolating filters; the BOD dropped by 98 ppm, and that of the bio-floc effluent by 67.5 ppm.

"Progress of Sewage Treatment at Luton." By S. G. Evans, Engr. & Mgr., Luton Purification Works. *Municipal Engineering*, July 1.

Other Articles

"What is the Future of **Refuse Disposal?**" Call for thorough investigation of problem of increasing seriousness. By F. L. Stirrup, Director of Public Cleansing, Salford, England. The Surveyor, June 18.

Calculations in designing **"Percolating Filters."** By L. B. Escritt. Municipal Engineering, June 17.

"Stepping Up a Forty-Year-Old **Trickling Filter** Plant." Improvements at the Plainfield Joint Meeting Plant made in 1949. By Andrew Palmer, Supt., and Peter Homack, San. Engr. Wastes Engineering, July.

"A 17-year Old **Transite Sewer"** still has an **n** value of 0.010. Water & Sewage Works, June .

"Tampa Expands Sewage System Second Time in Three Years," reducing bacteria counts in the Hillsboro river from a maximum of 160,000,000 to a low of 350. Public Works, August.

"Sewage Treatment and Disposal in **Austria."** By Joseph E. Seidling, Chf. Engr., Vienna. Municipal Engineering, July 1.

"Controlling the Pests of **Refuse Tips."** By A. A. Green, Pest Infestation Lab., Slough, England. Municipal Engineering, July 1.

"Fly Baiting" by use of sweetened insecticides. By Carroll N. Smith and

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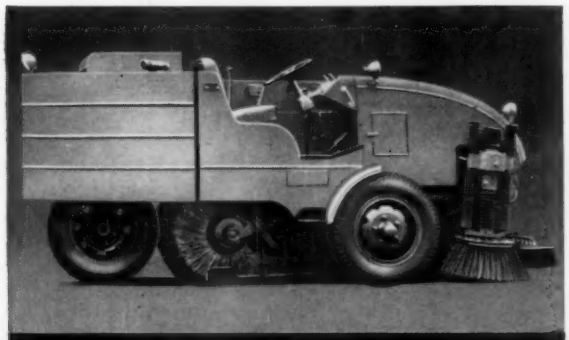

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J. C. Keller, Entomology Research Branch, U. S. Dept. of Agriculture. American City, July.

"City Staff Builds **Sewer Gauging** Unit" at Cincinnati, O. Engineering News-Record, July 21. (See "Gauging Industrial Wastes" in Sewerage Digests).

"Hydraulic Research on **Storm-Drainage Problems,**" including improving catch basin design, and rainfall-runoff studies, being conducted by the city of Los Angeles. Public Works, August.

"**Water Pollution** Research in England." Absorption of atmospheric oxygen by rivers; effects of detergents. Public Works, August.

Restrictions on Water Use for Air Conditioning

ASKED the question by the Editors of Public Works "Do you have specific limitations on the amount of water used for air conditioning?", top water works officials of 557 communities said "No" and similar officials of 78 other communities said "Yes".

Some interesting comments were appended, mostly from those who have limitations. Auburn, Ala., requires all units with capacity greater than one ton to have a circulator. Tucson, Ariz., has an ordinance which states that "water cooled refrigeration equipment shall, except as provided in subsection (b), be equipped with a cooling tower, evaporative condenser or other water saving equipment. A connection may be made between a unit and a sanitary sewer system for the sole purpose only of cleaning and draining the water saving equipment of said unit." Subsection (b) provides that "all evaporative type coolers in business or industrial districts shall either be equipped with recirculating pumps or may, where such facilities are available, be connected with the storm sewer. In residential districts the surplus circulation water from evaporative type coolers or water cooled refrigeration coolers of 5 hp. or under may be dissipated upon lawns or used in connection with other vegetable growth provided, however, such water shall not be permitted to run or to be drained off into any street or alley."

In Phoenix, Ariz., water from air conditioning units may not be discharged to sewers or storm drains. A cooling tower is required by Forest City, Ark., for units 5-ton and larger. Modesto, Calif., requires recirculation; in Pasadena, Calif., the only restriction is on the rate of discharge of the cooling water into the sewer. Water must be reused in New Haven, Conn., if the unit is over 3 tons capacity. In Waycross, Ga., cooling units up to 5 tons may use city water; all larger units must have a tower for water conservation.

Comprehensive regulations have been adopted in La Grange, Ill. The use of water is prohibited (a) when used directly from the mains as a cooling medium in air washers or any type of equipment whereby the air to be conditioned comes into direct contact with sprays or wet surfaces, or where the water is used as the direct or indirect cooling medium in coils; and (b) in all compressor type refrigeration units having standard rate capacities of 1½ tons or less.

Compressor type refrigeration units having standard rated capacities of from 1½ to 5 tons may be equipped with water cooled condensers using water from the mains; provided that not more than one such unit with such capacity and so equipped may be used in an air conditioning or refrigerating system, except for emergency standby purposes.

Compressor type refrigeration

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units having standard rated capacities of 5 tons or over shall be equipped with evaporative coolers, evaporative condensers, water cooling towers, spray ponds, or other cooling equipment so that all water from the mains is used for make-up purposes only.

If other than compressor types of refrigeration units are used the consumption of water from the mains shall be limited in amount to not more per ton of refrigeration produced than would be used by the compressor type. The maximum allowable water use in gallons per minute per ton will be 0.1 for any unit.

Other Communities

There is no actual restriction in Burlington, Iowa, but there is a minimum monthly charge of 20 percent of the maximum billing for the previous 11 month period. This is not an actual restriction but an attempt to receive some payment for capacity demanded.

Manhattan, Kans., also has a broad ordinance of which the following is an essential part: "Subsequent to the effective date of this ordinance no person, firm or corporation shall be permitted to connect any air conditioner or refrigeration unit designed to use city water for cooling, to any water tap, main or other part of the water distribution system of the City of Manhattan, unless such air conditioner or refrigeration unit shall be equipped with a recirculating unit or have a cooling tower attached for conserving water. Before any such air conditioner or refrigeration unit shall be installed and attached to or connected with the Manhattan water works system, the person, firm or corporation proposing to do so shall make application to the Superintendent of the Waterworks system for, and be granted a permit to make such installation and connection."

Following is a summary of the regulation in effect in Boston, Mass.: "No water shall be used by any water taker in any air conditioning system requiring, when in operation, more than sixty cubic feet of water an hour unless (1)—such system is constructed that water cannot flow therefrom into the source of supply or the City's pipes or mains; (2)—such system includes a device enabling the re-use of water supplied to such system; and (3)—such re-use device is in operation whenever such system is in operation."

In St. Louis
2 rubber-tired units spread, compact and cover 100 truckloads of trash daily
One Tournatractor and one D Tournapull easily spread and cover 100 five-yard truckloads of trash a day at a private sanitary landfill operated by Harold Macoy, Jr., president of the St. Louis Sanitary Landfill Company in St. Louis, Missouri. This corporation specializes in sanitary landfill. They handle the operation in this way:
Trucks, ranging from 5 to 30 cubic yards in capacity, dump all types of refuse including garbage. The Tournatractor, weighing over 33,000 lbs., dozes and compacts it under 28 lbs. per square inch pressure. When trash layer gets a few feet deep, the 7-yd. Tournapull, either self-loading or push-loaded by the Tournatractor, hauls and spreads a dirt cover. When the layers of trash and dirt reach 24 ft. deep, a final 2 ft. cover of dirt is brought in, and dumping extended into another area.
Although the landfill is open 24 hours a day, 365 days a year, this LeTourneau-Westinghouse team, working less than 5 hours a day, covers all rubbish with ease. Immediate clean-up and covering prevents odors, fly and rat breeding and fires or smouldering . . . eliminates any community nuisance. Contractor saves money, too, through low equipment inventory, and the city benefits through simple, economical disposal of a large portion of its trash. Equipment owner Harold Macoy formerly used 2 crawler tractors, a dragline, and 2 trucks for this work, but the crawlers were too slow, compaction was inadequate, and clogging of tracks with wire and trash caused excessive downtime. Mr. Macoy says: "My Tournatractor and 'D' can handle all of St. Louis commercial and industrial trash in all kinds of weather."
Other communities have solved their rubbish or garbage disposal problems in a similar way. In smaller cities, D Tournapull, equipped with dozer blade and working alone, spreads refuse, digs trenches, hauls, and spreads cover. In other municipalities, Tournatractor pulls a scraper to dig trenches and haul cover.
With either high-speed LeTourneau-Westinghouse machine—city-owned or under private contract—your community can have clean, sanitary rubbish disposal without the eye-sore and odors of an open dump. Get facts from your LeTourneau-Westinghouse Distributor.
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Macoy also uses 7-yd. D Roadster Tournapull to bring in cover for refuse. Rig is powerful enough to self-load, yet has ample capacity for push-loading.
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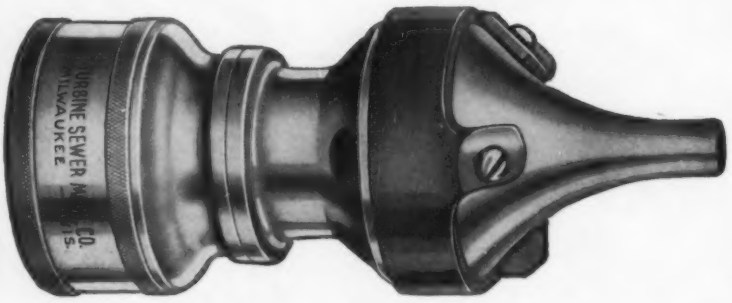

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New Type Lighting for Large Areas

A new and efficient general lighting system, seen as a forerunner of many large industrial, commercial and institutional lighting installations, has just been completed at Schenectady, N. Y. Installed in Union College's Alumni Memorial Field House, the system is the first application of high-frequency fluorescent lamp operation for the general lighting of a large area.

Designed and developed by the General Electric Company, the system calls for the operation of 490 8-ft. long slimline fluorescent lamps on 400-cycle power. Increasing the frequency to 400 from the standard 60 cycles is accomplished by means of two 30-kilowatt rotating-type GE package-unit frequency converters. Chief advantage of the system is that it represents one of the most economical methods yet devised for obtaining higher levels of light in high-bay areas, according to John H. Campbell, G-E illuminating engineer, who conceived and developed the technique. The system cost approximately 15 percent less to install than an incandescent-mercury lighting system originally considered for the field house. In addition, the 400-cycle system offers an estimated 50 percent savings in annual operation and maintenance cost while producing 20 percent higher levels of comfortable light.

The problem at the Union College Field House was to illuminate 44,000 square feet of floor area to a maintained light level of 45 footcandles. As the area was to be used for basketball games, and as a practice field for baseball, football, track and lacrosse, fluorescent lighting was considered desirable in order to avoid the relatively higher brightness inherent in incandescent-mercury systems. High-frequency operation made fluorescent lighting practicable for this installation because each fixture weighs 110 pounds less than for a comparable 60-cycle system, and because wiring costs are much lower.

The level of illumination — between 45 and 50 footcandles — is high; it is more than twice the amount of light provided by most typical field house installations. High-frequency permits operation of slimline fluorescent lamps at light levels from 20 to 50 percent higher than the same lamps operated on the conventional 60-cycle power. Lamps at the Union College field house are operated at 22 percent

over their 60-cycle rating in watts.

Installation of rotary frequency converters permits use of ballasts that are simpler, more efficient, and about one-fifth the size and weight of regular ballasts. The converters themselves are comparatively low in cost and reliable in service.

The lighting fixtures, designed by Carl J. Allen, G-E school and indoor sports lighting specialist, were made by Curtis Lighting, Inc., of Chicago. Largest fixtures ever used for high-bay lighting, they are eight feet square, but weigh considerably less than would comparable fixtures in conventional lighting installations. Each fixture contains 14 slimline lamps. Lighting fixtures are mounted at heights varying from 60 feet in the center to 34 feet on the sides. Each lamp produces 6000 lumens. The entire lighting job produces a total of about three million lumens.

The lighting layout is so arranged that each of the two rotary converters operates the lamps to allow for approximately equal distribution of light. A simplified wiring system reduces the number of circuits from 84, for the lighting method originally considered, to 14 for the high-frequency design.

The primary power source for the system is 220 volts, three phase, 60 cycles, and the secondary is 575 volts, three phase, 400 cycles, connected to be under 300 volts to ground. Since 400-cycle power is used, it is possible to employ a simple series capacitor and series choke for ballast on alternate lamps. The split-phase circuit produces unity power factor to obtain maximum utilization of the converters.

Howard D. Kurt, G-E electrical engineer, made the wiring layout for the installation, and also helped design the power system.

• • •

Aircraft of Aerial Engineering Section Kept Busy

In the calendar year of 1954 the aircraft of the Aerial Engineering Section, State of Ohio, flew approximately 57,000 miles and 3705 aerial photographs were exposed. The laboratory made 12,422 contact prints, 2307 enlargements, 1235 copy negatives, 624 plates, 58 lantern slides and 1500 ozalid prints.

The photogrammetric unit prepared 176 site plans for bridges, 12 topographic maps and 28 miles of cross-section by the use of stereoplotting machines and laid 27 mosaic aerial photo maps covering an area of 780 square miles.

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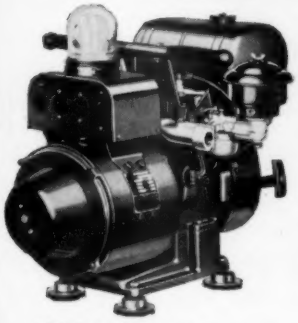

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The WATER WORKS *Digest*

Meter Cleaning And Repair Procedure

Washington, Ind., meters 3500 services. The meters are inspected and cleaned at intervals. The methods employed are as follows: For cleaning, Dearborn meter-cleaning solution No. 134 is used. The chamber is inspected for pit holes; if the ball sockets are badly pitted the chamber is thrown away. The thrust roller slot is examined for excessive wear. The disc is checked for warping, using a straightedge, and examined for cracks. The disc ball is checked for swelling; and the thrust roller hole for wear. The clearance of the disc in the measuring chamber, and in the ball socket are checked. In the gear train, spindles, gears and bushings are checked for worn and oversize holes, and the control roller for flat spots. New packing is put in the stuffing box. After reassembling the meter, the workers blow into the outlet to check freedom of movement.

"Meters for Efficient Operation and Water Conservation." By L. A. Gutsch, Supt. *Water Works Engineering,* July.

Ground Water Recharge By a Manufacturing Plant

The manufacturing plant of the Upjohn Co. at Kalamazoo, Michigan, uses 6.5 mgd of well water for air conditioning. Approximately 50% is reused for various purposes; some for the fourth time in irrigating. In an effort to further conserve water, in 1952 a recharge pond was constructed having an area of 10,000 sq. ft. and filled with clean, warm waste water 3 ft. deep. A percolation rate of 115,000 gpd was determined, the temperature falling from 73° to the normal 50° ground water level. The water traveled underground at the rate of 1.75 ft. per day, chiefly toward the company's wells. In 1954 this pond was enlarged to 50,000 sq. ft. and another 90-acre area used for recharge. The latter recharges 16% of the total water supply and the first pond 9%.

"Ground Water Recharge Operations." By W. H. Sisson, Engr. of the Upjohn Co. PUBLIC WORKS, August.

Liquid Alum Storage at Chicago

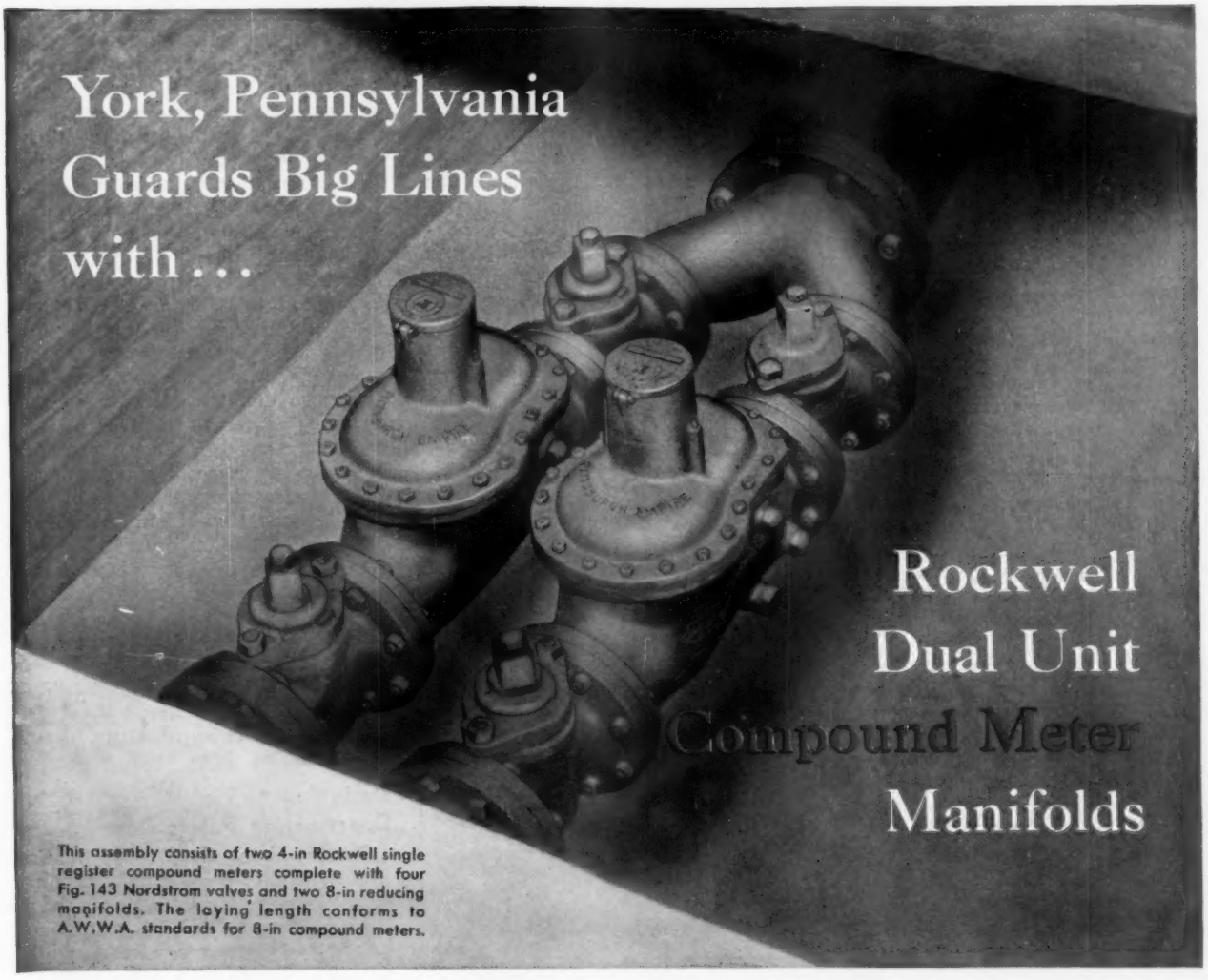
In 1954 the contract price for liquid aluminum sulfate was 7.5% less than for dry alum, and the Chicago South District Filtration plant, which had been using dry alum, was changed over to use liquid alum in August, 1954, with a capacity for feeding the equivalent of 40,000 lb. of dry alum per day. In addition to giving a net saving of $3.81 per ton of alum, there is a saving in wear and tear on equipment, and in work involved in loading the dry feed scale hoppers each day. The liquid system also provides a more uniform feed rate and is not subject to occasional overfeeds and underfeeds; and a change in feed can be made by merely adjusting the needle valve on the rotameter.

The liquid alum is stored in two 40,000-gal. concrete tanks lined with lead. For conveying the liquid alum, stainless steel pipe was installed, with valves made of causul metal with stainless steel discs and seats, and Durimet pumps. The valve metal was found, after 5 months, to have corroded away, and the valves are being replaced with others made of all stainless steel. Rotameters are used to measure the rate of feed, and a constant-level tank of ¼-in. stainless steel in connection therewith.

The liquid was at first delivered in tank cars, which were several days enroute, and in cold weather its temperature fell below the saturation point, causing crystallization in the tanks. To eliminate this trouble, the liquid is now delivered in tank trucks from the alum plant 39 miles away. At first there was

Four 20-Yd. Refuse Collection Units for Fort Pierce

FOUR M-B refuse collection units destined for Fort Pierce, Fla., are shown here. The photo, taken just before starting on the long trip from New Holstein, Wisc., shows the 20-cu. yd. bodies mounted on Dodge TA8-192 trucks which have a GVW of 21,500 pounds and 5-speed transmissions. This shipment is one of a number of recent deliveries by the M-B Corp. De-Boliac Truck Equipment Co. of Miami handled the sale; George Morse of Atlanta, Ga., is district representative for M-B. Ed Stanton is City Manager of Fort Pierce.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trouble with crystallization in the storage tanks. To prevent this, the liquid is diluted with water as soon as it is received, 250 gal. of water being added to each 4,000-gal. truck load. This has eliminated all such trouble.

"Liquid Alum Storage and Handling Equipment." By O. Gullans, Chf. Chem. Engr. *Pure Water,* June.

Emergency Operation During Peak Consumption

Dallas, Texas, serves water to 550,000 population distributed in two low-level and three high-level service areas, with elevations ranging from 398 to 550 ft. above sea level. The high-level areas are fed through two 1-mg elevated tanks, by water drawn by two booster pumping stations from mains in the low-level. The peak hour demand some days has been three times the peak day demand, which in turn has been 2½ times that of the normal day. The peak demand occurs at about 6 to 8 P.M. Last summer the pressure in parts of the high-level areas at times fell to 17 psi at 4 P.M. and the tank valves were closed until 6 P.M. to provide water for the peak-demand hours. During the night the tanks were filled again by the booster pumps. When hot weather arrived, the booster pumps drew so much water from the low-level area that the pressure there became dangerously low. During this emergency, a man was stationed at each booster pump and one at each tank. The ones at the tanks took them off the system before 7 A.M., doled the water out from 5:30 to 8:15 P.M., then put the tank fully on the system. The men at the booster stations began at 5:45 P.M. to pinch the discharge valves so that the pressure on the suction side remained at 32 psi for one pump and 14 psi for the other. When the pressures in the low-level system rose above this, the valves were opened wide. In July the heavy consumption drew the main reservoir to a very low level and alternate-day sprinkling was ordered, which reduced the consumption by 7-9 mgd and prevented serious trouble.

"Coping With Summer Distribution Problems in Dallas." By J. D. Henry, Supervisor of Distr. *Jour. AWW Ass'n.,* June.

Designing and Constructing Peters Dam

Peters dam, built by Marin County, Calif., is an earth embankment with rock-fill faces, with a base length of 1,100 ft., maximum height of 185 ft. and a crest width of 750 ft. There were some unusual features in the designing and constructing of it. The preliminary design was based upon an aerial map with 20-ft. contours which proved to be sufficiently accurate for determining the reservoir capacity and selecting the approximate site of the dam. The stream being dammed was used as a water supply by several communities lower down, and was necessarily made turbid by the clearing of the reservoir site. A temporary filter plant was installed below the site which reduced the turbidity of the stream from 10-500 ppm to below 5 ppm. This plant consisted of a 50,000-gal. redwood tank which provided mixing, flocculation and settling, and another tank containing a rapid sand filter.

An inclined outlet tower was constructed along the bank of the reservoir, consisting of a 48-in. reinforced concrete pipe containing six inlet openings at different levels. The foundation rock under the dam was pressure-grouted, and, because of the generally shattered and broken nature of the basalt rock,

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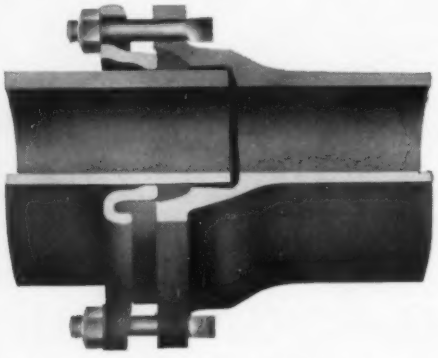

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the surface was sealed by grout gunited on. The pumping plant consists of a 5 mgd centrifugal pump and 200 hp motor mounted on a movable truck that can be kept at water level by raising or lowering on a ramp laid on a 1:1 slope.

"Design and Construction of Peters Dam, Marin County, Calif." By William R. Seeger, Gen. Mgr. & Chf. Engr. *Jour., AWW Ass'n.*, June.

Fluoride Analysis And Determination

Two papers in the June *AWWA Journal* discuss the use of the zirconium-alizarin procedure. One concludes with the statement that permanent color standards, such as those used with the Hellige and Taylor comparators, can be used wherever the direct colorimetric analysis can be applied; and that the results obtained, supplemented by data obtained from records of water pumped and pounds of fluoride fed, should give all information necessary for control of most fluoridation installations.

The authors of the second paper say that, with the proper technique and attention to the effect of interfering substances, the zirconium-alizarin procedure will provide accuracy within 0.1 ppm fluoride. Such interferences were found to be greater than has been reported by others. This presents a problem, and it is expected that better methods are still to be evolved.

"Use of Permanent Standards in Fluoride Analysis." By R. E. Frazier, State Dept. of Health, Minnesota.

"Factors Affecting the Determination of Fluoride in Water With Zirconium-Alizarin." By William L. Lamar and Paul G. Drake, U. S. Geological Survey. *Jour., AWW Ass'n.*, June.

Storing Well Water To Meet Peak Consumption

The Colne Valley Water Co. (England) supplies water to about 573,000 population in the outskirts of London. The average daily demand is 23.2 mg but is increased about a third during summer drought periods. Water is obtained from wells and the available supply is almost fully developed and can barely meet the peak demands. To provide for an increase in these, the company has built a reservoir into which well water will be pumped during low demand months and held in storage, and withdrawn at rates up to 10 mgd when needed.

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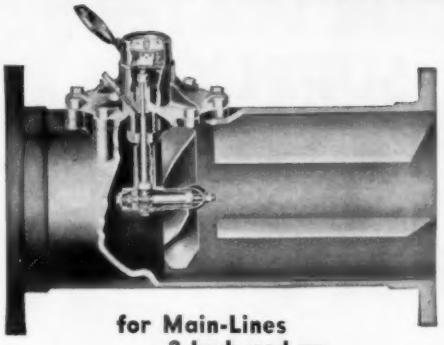

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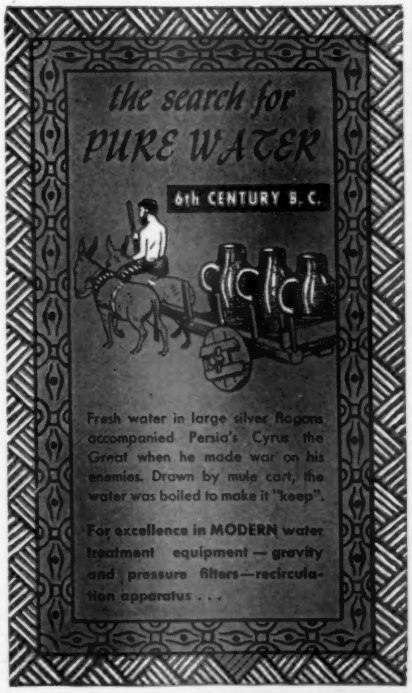
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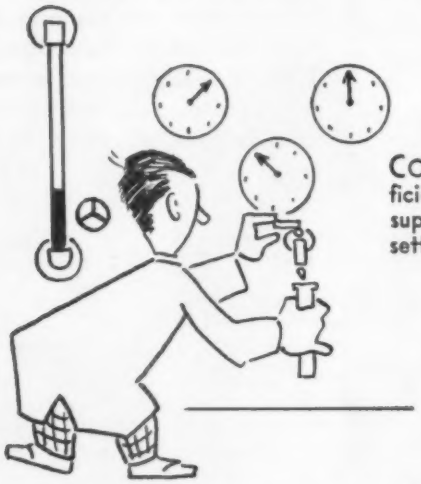

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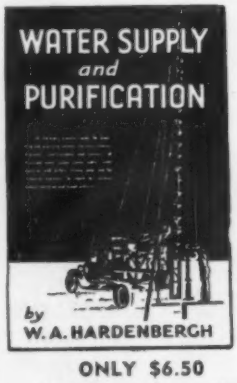

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This water will pass through microstrainers and be further treated. The reservoir is formed by building a dam half a mile long and 50 ft. maximum height across a valley. (Capacity is not stated.)

"Reservoir Will Store Raw Well Water." *Municipal Engineering,* June 10.

Making Metering Acceptable to Consumers

Quakertown, Pa., in 1953-54 changed from flat rate to metering, installing 1350 meters. This was preceded by a publicity program which stressed that metering was the only fair way of charging for water. An ordinance was passed providing that the borough would pay for the meters and ordinary costs of installation, or the consumer could employ plumbers to install them and the borough would pay $6.00 toward the labor costs. Bids for furnishing the meters ranged from $20.16 to $20.42. Twelve local plumbers were asked to name prices for installing the meters and these ranged from a lump sum of $7 to $9 plus materials; or, on an hourly basis, $2.10 for a master plumber plus $1.60 to $1.85 for his helper. Finally several agreed to a charge of $3.75 per hour for both, or $2.25 for a master plumber working alone; an ordinary installation to cost not over $6. The use of copper meter yokes or copperhorns reduced the labor cost by more than $2, or about enough to pay for the yokes. There were few complaints about increased water costs due to metering, believed to be due to the publicity program.

"To Meter or Not to Meter." By Ralph L. Yanish, City Manager. *Public Works,* August.

Development Of Chlorinators

Measuring and controlling the rate of applying liquid chlorine is complicated by the fact that it is a vigorous oxidizing agent, attacking most metals; and that its condition between gas and ice depends on comparatively small temperature variations. Thus ordinary mechanical devices such as pressure control valves, pressure gauges, safety devices, and one for preparing and delivering a solution of chlorine in water, require the use of special materials and methods. Before 1953, most chlorinators included hydraulic devices for pressure and vacuum relief. But improvements in the purity of chlorine and the invention of materials that are completely re-

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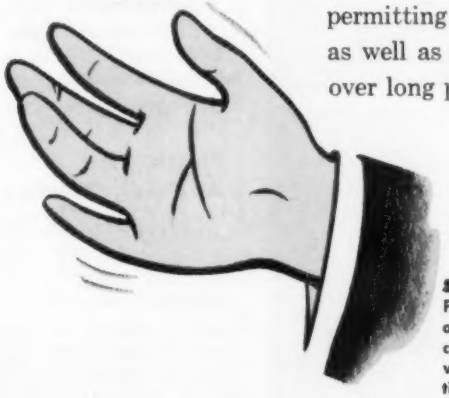

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sistant to chlorine have permitted the design of chlorinators which substitute mechanical devices for hydraulic ones as exemplified by the bell jar and water tray, giving a completely closed system.

"A Full Cycle in Chlorinator Design." By Walter L. Savell. *Water & Sewage Works*, June.

Maintenance of Well Screens

The life of a screen can be extended and impending trouble indicated by systematic operation—a realistic pumping schedule based on information secured from performance data, which should be collected from two relatively simple instruments, as described in this article. A ¼-inch air line is the most widely used method for measuring the water level, both when pumping at various rates and under static conditions. Some means for measuring the rates of flow from the well should also be available. One of the various pitot flow gauges, preferably of the continuously recording type, would be satisfactory for the usual closed pipe discharge. If under a constant rate of pumping, the records show an increased drawdown, clogging of the screen or adjacent formation is likely. On the other hand, data showing a decrease of both the static and pumping water levels indicates a receding water table. The pumping rate should be reduced at the first sign of screen clogging.

"Getting The Most From Your Well Screens." By Paul W. Clinebell, Instructor, San. Eng., University of Illinois. PUBLIC WORKS, August.

Designing Clarifiers And Softeners

The author describes the history and development of solids contact units for water treatment. In designing such units, the rates in gpm per sq. ft. should vary with specific plant conditions and the results to be obtained. Formulas for calculating rates are given in the article. For cold process softening, design rates of 1.5 to 2.5 gpm are recommended, or in some cases, up to 2.7. For clarification of fairly clear waters, which produce a light floc with the use of alum and iron salts, design rates of 1.25 to 2.0 gpm are generally selected; or possibly up to 2.50 gpm in some cases, as in treating warm, more turbid waters.

"Design of Water Clarifiers and Softeners." By V. J. Calise, Graver Water Conditioning Co. *Water & Sewage Works*, June.

Plastic Pipe At Perry, Oklahoma

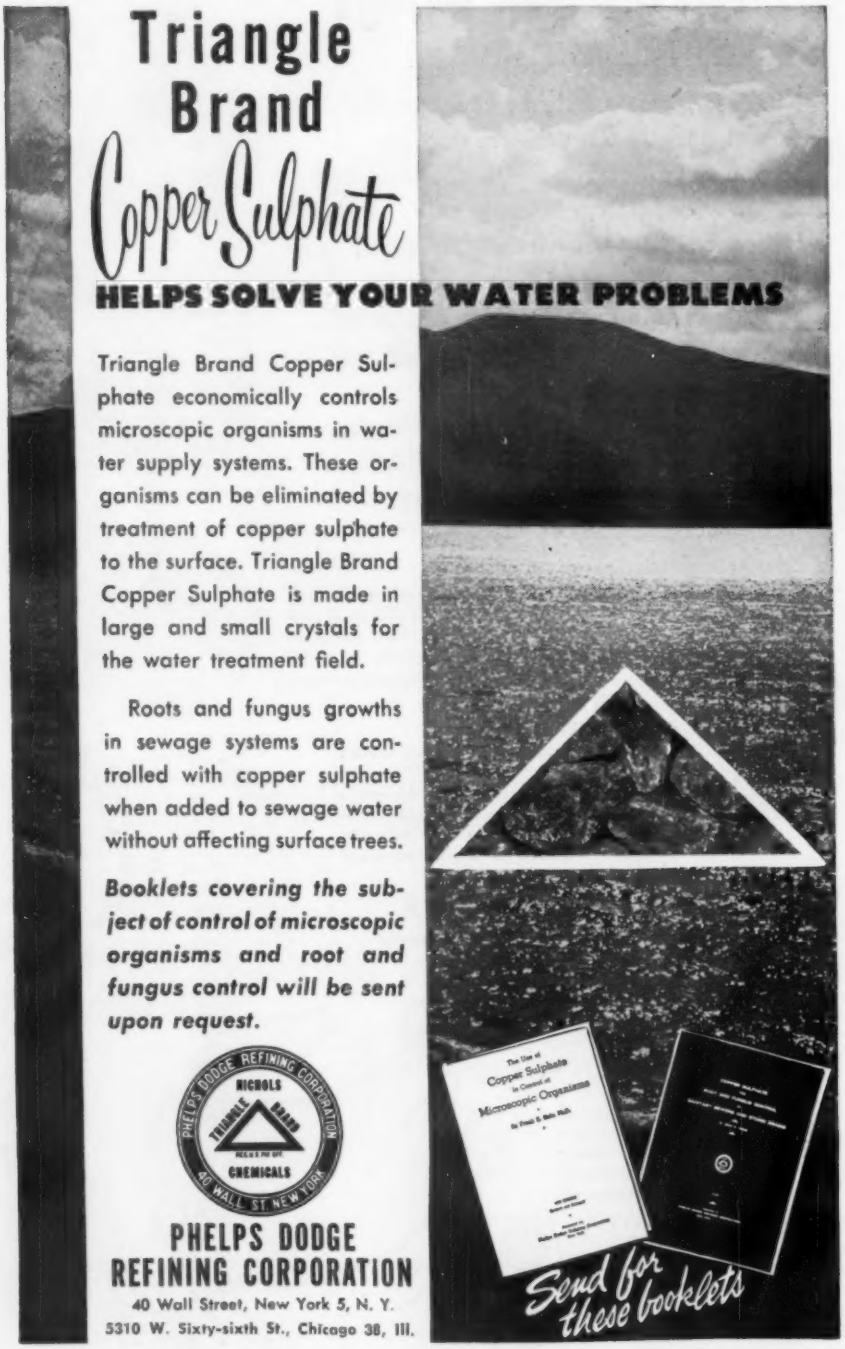
Perry recently drilled four 6-in. wells 45 ft. deep to increase its supply. For gathering the water so obtained it used 1½-in. Carlon plastic pipes, laid in a trench 6 in. wide and 24 in. deep, this being below the local frost line. The cost of 1700 ft. of this pipe was 36¢ per foot for the pipe and 10¢ per foot for trenching and backfilling by contract. The cost of the four wells, including pumps and automatic controls, was $2400.

"Small Wells Near River Bed Provide Emergency Supply." PUBLIC WORKS, August.

Other Articles

"Municipal Management of Water Works in West Virginia." Many systems suffer from neglect and abuse. By H. K. Gidley, State Dept. of Health. Jour. A.W.W. Ass'n., June.

"Financing Extensions in Maryland and Delaware." Advantages of financing authorities in Maryland. By Charles B. Wheeler, Baltimore Co. Met.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Dist.; Alfred Machis, Washington Suburban San. Com.; and W. Compton Wills, Chf. Engr. Water Com'rs., Wilmington, Del. Jour. AWW Ass'n., June.

"**Measuring Yield** of Drilled Wells Without Pumping," to determine whether drilling should be stopped or continued. By Abraham Katz, Tel Aviv, Israel. Jour. AWW Ass'n., June.

"Design of **Wye Branches** For Steel Pipe." A description in detail (50 pages) of a practical and economical method for designing large-diameter wye branches. By H. S. Swanson, H. J. Chapton, W. J. Wilkinson, C. L. King and E. D. Nelson, Los Angeles Dept. of Water & Power. Jour. AWW Ass'n., June.

"New Method for Detection of **Coliform Organisms.**" Primary inoculation in a new buffered desoxycholate glucose broth, followed by confirmation in buffered desoxycholate lactose broth. By A. A. Hajna and S. R. Damon, Indiana State Bd. of Health. Jour. AWW Ass'n., June.

"A Case History of a **Water Shortage,**" Thomasville, N. C. By J. L. Morrison. Public Works, August.

"The Benefits of **Effective Metering,**" as presented at hearings of the U. S. Tariff Commission by Morrison B. Cunningham, Supt. & Engr., Oklahoma City Water Dept. Water & Sewage Works, June.

"Water Service and What It Costs: Completely Adequate **Treatment Facilities.**" By E. H. Aldrich, Chf. Engr., Am. W. W. Service Co. Water & Sewage Works, June.

"Designing, Constructing and Maintaining **Centrifugal Pumps,** Part 6." By Roy Carter and Igor J. Karassik, Worthington Corp. Water & Sewage Works, June.

"**Water Charges** to Areas Outside Corporation Limits; principles applied at Ann Arbor, Mich. By Louis E. Ayres. Water Works Engineering, July.

"**Nuclear Power** and Fallouts Will Affect Water Supplies." By Nelson P. Jackson, General Electric Co. Water Works Engineering, July.

"The **Lawn Sprinkling Load.**" Milwaukee uses storage tanks to meet the evening demands for sprinkling lawns. By Edward F. Tanghe, Supt. Public Works, August.

• • •

Cost of Highway Striping

Using reflectorized paint, produced by adding glass beads to the freshly painted lines, the cost last year to the Virginia Department of Highways for 100 lineal feet of plain paint was $0.783, and for the reflectorized paint, $0.848.

Charges for Dwellings in Annexed Area

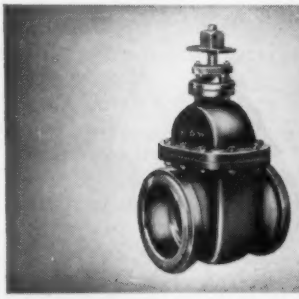
A study made four years ago by Hayward, California, indicated a capital cost for new residential areas of about $800 per acre. This cost included the extension of water mains and sewers, construction of water and sewerage plants, and the provision of fire, police and other services. Another study was made earlier this year, and this showed that the cost had risen to nearly $1200 per acre. The zoning requirements permit five lots per acre. On a 50-50 basis, it was determined to require payment of $120 per dwelling unit in annexed areas, whether built before or after annexation. The later study showed that water and sewer extensions and plant facilities cost about $767 per acre of annexed area.

• • •

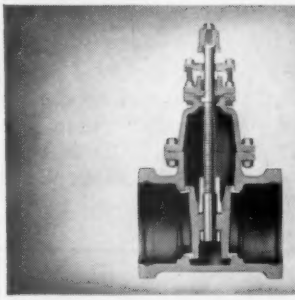
Rubbish Collection Reduces Fires

Rubbish and litter, as a cause of fires, increased from 0.85 percent of all fires in the decade 1934-1943 to 1.70 per cent in the following ten years, according to the National Board of Fire Underwriters.

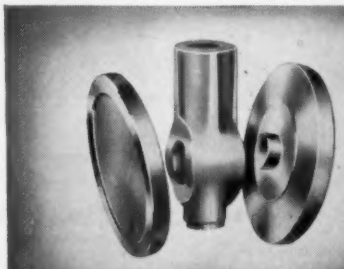
R. D. WOOD GATE VALVES PROVIDE POSITIVE FLOW CONTROL AFTER YEARS IN THE LINES



Here's what the R. D. Wood Gate Valve looks like from the outside — rugged, simple, streamlined. It is built for generations of dependable service in the lines. Available with all pipe connections, including mechanical joint.



Strip it down to a sectional view and you can see why interruptions in service are rare. There's virtually nothing to go wrong — none of the complicated small parts that fail in an emergency because sediment and scale render them inoperable.



Bring the R. D. Wood Gate Valve down to its essentials and you have the spreader and two discs. Rising or descending, discs are free to revolve completely, thus distributing wear evenly. In closing, discs are fully lowered before spreading action begins. Fully opened, components move out of the water way, providing full pipe capacity.

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Measuring Atmospheric Pollution

A portable ultraviolet photometric analyzer has been devised which offers distinct advantages over other types of instruments for measuring atmospheric pollution by toxic gases. The method is sensitive; the equipment is relatively simple and permits measurements with a minimum time delay. Analyzers of this type previously available have provided only one analytical wave length and calibration has been difficult. The analyzer described involves the use of an ultraviolet source, a double-beam optical system, vacuum-phototube detectors, and an electronic microammeter. It is normally extremely sensitive not only to mercury, ozone, benzene, ketones, chlorinated ethylenes, and sulfur dioxide, which are absorbed at 254 mμ, but also to nitrogen dioxide, carbon disulfide, chlorine, and bromine, which are absorbed at longer wave lengths. By using optical filters in the measuring beam, the sensitivity to compounds absorbed at different wave lengths may be varied to avoid interference. The sampling tube is preferably of glass or saran to minimize absorption of gases during sampling. The long warmup period is a disadvantage but may be overcome by mounting the apparatus on a cart and equipping it with storage batteries and a vibrator for supplying 115 volts alternating current.

"Measurement of Atmospheric Pollution by Ultraviolet Photometry." By D. J. Troy, E. I. du Pont de Nemours and Co. *Analytical Chemistry*, August.

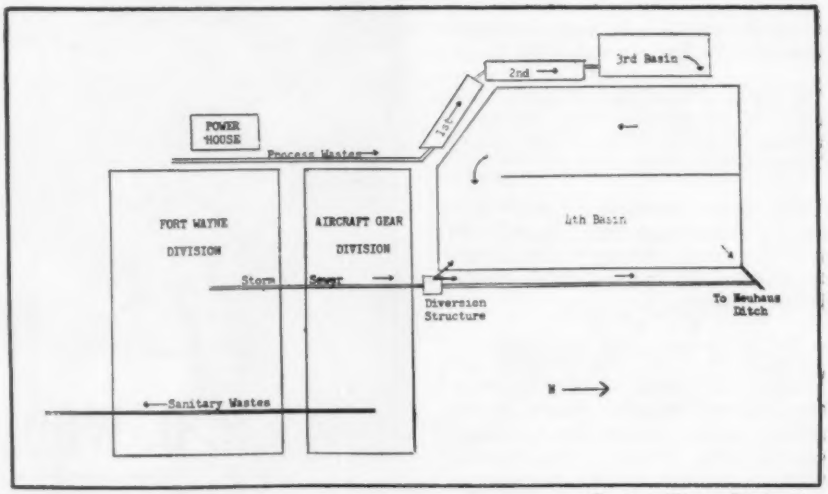
Lagooning Gear Wastes

In the metalworking field, particularly in hard water areas, wastes are likely to be self-clarifying to some extent, and advantage may be taken of this by lagooning. Tests of the rate of self-clarification will indicate the time the wastes should be returned in the lagoon, and this can be translated into size of lagoon. This size can be reduced, if necessary, by addition of small amounts of coagulants. If the wastes contain oil, it may be desirable to provide two or more basins in series, the first only as large as may be necessary to separate out the oil, and the final one large enough to provide biological treatment and stabilization. The final basin may serve as a reservoir for re-use water and fire protection. It is not advisable to put more lagoon area into use than is necessary, since healthy biological activity, particularly algae, are dependent upon sufficient nutrient to maintain growth. The writer describes a lagoon system used at plants of the Dana Corp. at Fort Wayne, Indiana. This consists of 4 basins and a regulating chamber that permits diversion to the final basin of as much cooling water as is desired to adjust the time of detention in this basin. The first basin reduces the BOD from 202 to 52 ppm, the suspended solids from 1484 to 79 ppm, and the oil from 2543 to 92.2 ppm. The oil is skimmed off through a slotted pipe, the solids will be removed by clamshell about once in five years. In the second basin the BOD is reduced to 33 ppm, the suspended solids to 51 ppm, and the oil to 45 ppm. The third basin reduces these to 19, 39 and 30, respectively. The fourth basin gives further reduction to 4.2, 12 and 11.5. The dissolved oxygen increases from zero in the second basin to 10.5 ppm in the fourth, and the turbidity from 12 to 92.

"Treating Aircraft Gear Wastes by Multi-Basin Lagooning." By Charles R. Griffith, Dana Corp. *Wastes Engineering*, July.

Radioactive Waste Disposal

Wider use of radioactive and fissionable material around centers of population creates a need for a better understanding of the atomic energy industry and its products. Radioactivity, the most important property of wastes in the nuclear energy industry, is not readily detectable without proper instrumentation. For a specific radioisotope, the characteristics of the radiation and the period of radioactivity are fixed by nature and cannot be changed by any practical means. Wastes are evolved in all phases of the nuclear energy industry. All material leaving a nuclear reactor must be under strict control. In air-cooled reactors, the intake air must be filtered to remove dust particles



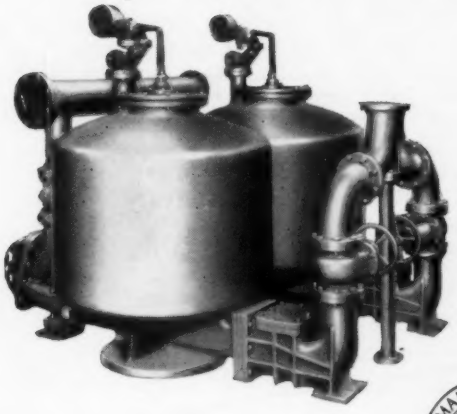
Courtesy Wastes Engineering

● **FLOW diagram of lagoon system to handle wastes from a metal-working plant.**

When you use a pneumatic ejector for lift station work . . .

selection of the most efficient equipment depends primarily on the gallonage to be pumped. Centrifugal pumps are quite effective when the volume is large, but when the gallonage scales down, a point is reached where good engineering switches from a centrifugal pump to a pneumatic ejector. That is why Yeomans makes both centrifugal and pneumatic ejector types and recommends the type of pumping equipment which experience has proven to be best suited in terms of efficiency, dependability and cost.

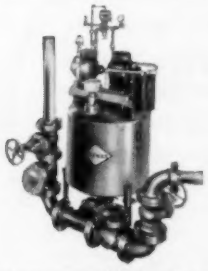
YEOMANS PNEUMATIC EJECTOR PUMPS



TYPE SDV SHONE® PNEUMATIC EJECTORS are the mechanically controlled type and are recommended for most installations.

The Shone Ejector passes solids up to 4" in the smallest ejector size and neither screens or shredders are required to prevent clogging. It has no internal parts to restrict flow; is simple in design, positive in action and performs indefinitely without wear, care or attention. Liquid waste is collected in a large pot containing an upper and lower bell. As the liquid level rises, first the lower then the upper bell is buoyed up to permit a counter balance to close the exhaust connection and admit compressed air. Air pressure closes the inlet check valve, opens the discharge check valve and the liquid enters the lift line under pressure. Maintenance is negligible. The simple parts are few and do not move far or fast. Frequent check-ups are not required. Capacities from 30 to 1.000 gallons; heads from 15 to 50 ft.

TYPE SEC SHONE PNEUMATIC EJECTORS are electrically controlled by two rigid stainless steel electrodes of unequal length suspended in the receiver. The rising liquid closes the circuit between them and energizes a relay which starts the air compressor. Compressor shuts off when liquid drops below the longest electrode. Otherwise the operation cycle is the same as in Type SDV Capacities from 30 to 600 gallons; heads from 15 to 50 ft.



PACKEX PNEUMATIC EJECTOR is an economy packaged, low capacity pump designed especially for small buildings, small residential groups and similar smaller installations which must have dependable lift service. It is factory-assembled and is received complete ready for inlet and discharge connections; no additional electric work is required, nor does it necessitate a wet well. It will handle solids up to 2½ inches in volumes up to 20 g.p.m. and is completely sanitary with a hermetically sealed pot.

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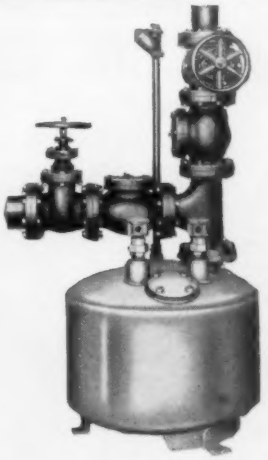
The Expelsor can be operated by plant air or steam, or by air from a Yeomans Air Compressor and is therefore adaptable to many different conditions. Capacities from 30 to 100 g.p.m. and larger; heads from 10 35 ft.



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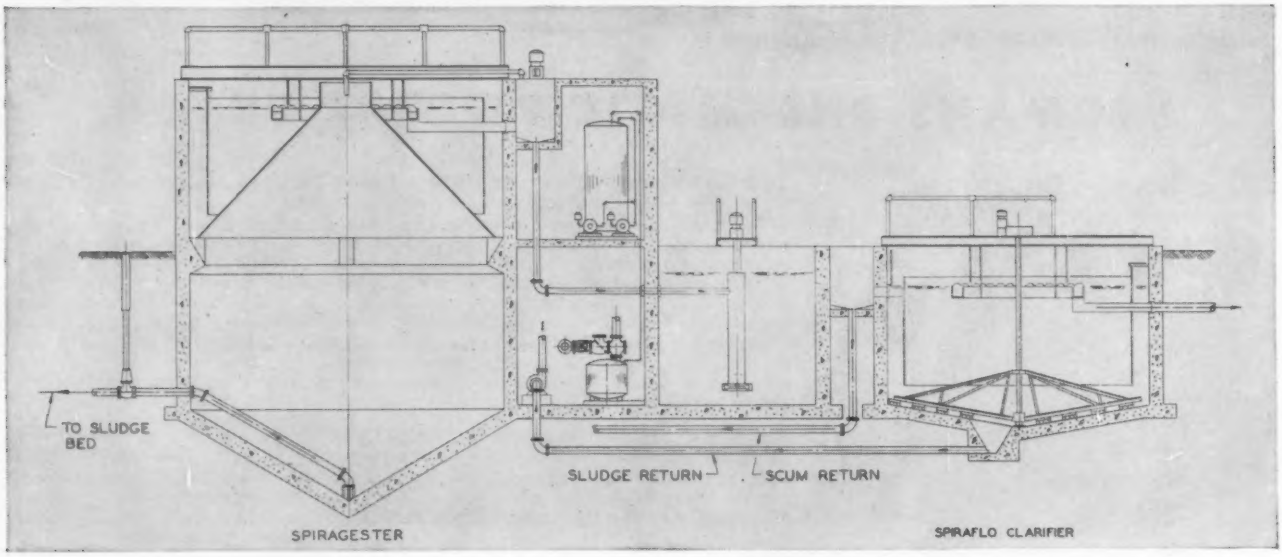

One of the many possible arrangements is illustrated. The secondary treatment is provided by the Cavitator mechanism, a specially designed rotor with two arms mounted on a hollow shaft through which air is drawn for dispersion through the tank contents. The arms are streamlined with the outer ends so constructed that when they are passed through the liquid at relatively high speeds they create a zone of cavitation through which the liquid is recirculated continuously. Air and liquid are drawn together creating a vapor pressure condition corresponding to cavitation with its tremendous forces. The oxygen is forced into the sewage and creates countless small air bubbles which permeate the entire liquid body.

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that might become radioactive and contaminate the effluent. Usually release through a high stack will permit natural dilution to a safe level. In water-cooled reactors, the water is treated to reduce dissolved and suspended material to low levels. The released cooling water is retained in basins for a few hours to permit radioactive decay and is then discharged into streams. In reactors cooled by recirculated water, the water is decontaminated by ion exchange units.

The more troublesome radioactive wastes from chemical processing include strontium, cesium and others in the rare earth series. The radioactivity of these wastes is intense, even when diluted, and the effective half life may be measured in hundreds of years. These high-level wastes are stored in underground tanks. Experiments are being conducted at Brookhaven National Laboratory to fix the radioactive waste material in montmorillonite clay which can then be buried. The use of the ocean or deep geologic structures as well as surface waterways for disposal of these wastes is also being studied. Other experiments in both land and sea disposal of high-level wastes are being carried out.

"Disposal of Radioactive Wastes—A Growing Problem." By Joseph A. Lieberman, U. S. Atomic Energy Commission. *Civil Engineering*, July.

DO Determinations In Oil-Field Brine

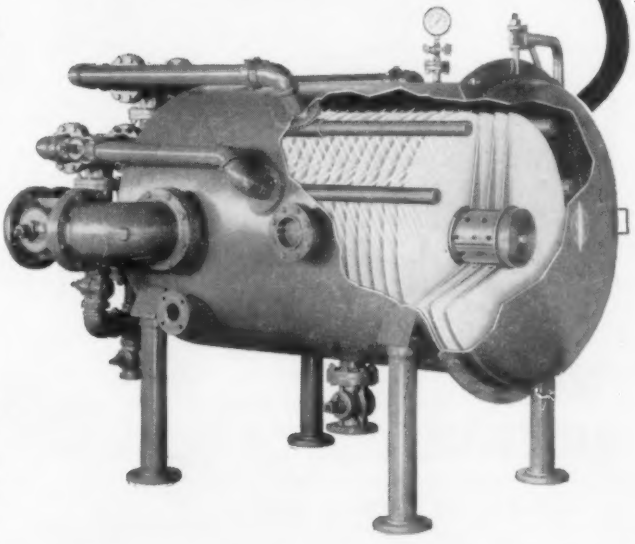
The use of an amperometric instrument for quantitative determination of dissolved oxygen in oil-field brines has advantages over modified Winkler methods in that the latter are subject to interference from iron, calcium, magnesium and reducing agents, as well as being less portable. Free chlorine interferes with the amperometric method, but this can be overcome if the free chlorine concentration is known. The method, however, cannot be used unless the solution is a good conductor with a resistivity less than 2 ohm-meters, equivalent to 3000 p.p.m. of sodium chloride. The over-all accuracy of the instrument using the Winkler method as a standard with 5% brine for 69 determinations average 3.4%, and varied from 5.6% at less than 1 p.p.m. oxygen to 2.7% with more than 5 p.p.m. oxygen. The basic instrument consists of a simple electrolysis H-cell, a rotating platinum microelectrode, a voltage source, and a microammeter for measuring diffusion current. It also includes a means of measuring the temperature of the brine. While none of the platinum microelectrodes tested were completely satisfactory, a glass-sealed type was the most successful. The H-cell consisted of a saturated calomel reference electrode and agar potassium chloride bridge. A potentiometric voltage-measurement circuit was used for measuring applied voltage. The circuit consisted of a Weston standard cell, a galvanometer and a voltage divider. A 1.5-volt battery was used as the working cell, in adjustment of the voltage applied to the rotating electrode, and in balancing the thermistor bridge for temperature measurement.

"Amperometric Instrument for Quantitative Determination of Oxygen Dissolved in Oil-Field Brines." By F. E. Armstrong, R. J. Heemstra, and G. W. Kincheloe, Bureau of Mines. *Analytical Chemistry*, August.

A new trend in municipal water filtration—

The SPARKLER DIATOMITE FILTER MODEL SCJ

has been highly successful in installations now in operation



Reduced operating cost due to long filtering cycles and fast backwash cleaning, together with a remarkably low bacteria count requiring a minimum of chlorination, are features that make this new type filter worthy of the attention of all waterworks engineers.

With every backwash cleaning, the used filter cake is washed out with the residue, and a fresh pre-coat of diatomite applied to the filter plates, providing a completely new sanitary filtering media with each cleaning.

This filter removes all silica, sand, algae, organic matter, silt, etc., from the raw water, and bacteria is reduced up to 80% and even more in some cases. The high quality of water obtained will raise the standard of water produced by some municipal water systems now using old methods of filtration.

Practically any volume of city water can be filtered economically in the Sparkler SCJ filter. Single units capable of handling 5,000,000 gallons of water a day are available. Multiple units can be engineered into a system for larger requirements.

Less than 0.2% of water is required to backwash and clean the largest filter units and a complete fresh precoat of diatomite can be applied and the filter ready to resume operation in 15 minutes.

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Sulfuretted Hydrogen Gas From Treating Dye Wastes

Cotton mills at Salisbury, N. C. discharge sulfur dye wastes that are highly colored, have a BOD ranging from 350 to 600 ppm, are almost septic and have a chlorine demand in excess of 200 ppm. For treating these wastes, the mill company arranged with the city to receive them into the sewer and treat them at the municipal plant, assuming part of the cost of the plant and the cost of all chemicals required except the chlorine. In chemically treating the dye wastes, air is used for flocculating and in a second mixing chamber. Secondary treatment is given in a high-rate biofilter. Operation started in May, 1954. At first, alum was used, but the sulfur odor was so intense that it was immediately discontinued. It was found, however, that if the pH was controlled at 7.0, good clarification and color removal could be obtained with a minimum of hydrogen sulfide generation, and this procedure was adopted, using 120 ppm of alum and 240 ppm of lime, costing $43 per mg. However, there was still sufficient odor to cause complaints, especially at night, from residents as far as 4 miles away. Learning of the successful use of "Orthosolv" at a neighboring city, a trial of this, applied ahead of the grit chamber, was started. The odors ceased. The use of lime was discontinued, making the alum treatment more efficient. Aeration, which had driven the sulfur odor into the atmosphere, was renewed, and treatment now consists of applying the deodorizer, 140 ppm of alum, air flocculation, settling and filtration. The only odor is a slight, bittersweet one, and complaints have ceased.

"Initial Operating Problems at Salisbury, N. C." By John N. Lesslio, Chemist & Supt. *Sewage and Industrial Wastes*, June.

• • •

Charging for Annexing "Fringe" Areas

A number of cities are charging for annexing fringe areas, according to *Public Management*. Pasadena, Calif., charges $100 per lot plus $200 per acre; and five other California cities also make charges. Aurora, Colo., charges $225 per acre and requires installation of all utilities.

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Base Stabilization Using Emulsion With Heated Aggregates

L. C. FITTS
Materials Engineer,
New York State Department of Public Works
Babylon, L. I., N. Y.

THE geometric design of the Nesconset-Hauppauge highway, 4.69 miles long, provides for two 24-ft. pavements separated by a 10-ft. mall, traversing a new right-of-way between Nesconset on Route 25 and the Veterans Memorial Highway at the Village of Hauppauge. The structural design of this pavement called for 5 ins. of calcium chloride stabilized sub-base, 7 ins. of bituminous stabilized base course, and a 1-in. bituminous concrete wearing surface.

The sub-base for a depth of 5 ins. consisted of selected soil that has from 8 to 15 percent of silt and clay; and not more than 50 percent of the material passing the 40-mesh sieve was to pass the 200-mesh sieve. Calcium chloride was incorporated into the soil at the rate of ½ lb. per sq. yd. per inch of depth or 2½ lbs. per sq. yd. for the 5-in. depth. The material was then brought to optimum moisture and rolled to a minimum of 95 percent of its maximum density. Maximum dry densities of 129.5# to 136.9# were recorded. Plate bearing tests using a 6-in. diameter plate went from 222 psi to 420 psi for a 0.30-in. deflection.

The 7-in. base course was mixed in a continuous type pug mill and consisted of sand, gravel, and loam, which is excavated from a borrow pit adjacent to the plant; and an asphalt emulsion designed to withstand the harsh treatment given to a mixture by a pug mill.

Exploratory borings on the available property along the right-of-way were taken and analyzed for gradation before the site was approved for use. Gradation tests indicated that by properly excavating the aggregates a satisfactory blend of gravel, sand, and loam would result.

A bulldozer was used to blend the three horizons of material into a fairly uniform gradation before the aggregates were pushed to within reach of the crane that was feeding the plant. The cooperation of the workmen was excellent and considerable credit must be given to them for the results obtained.

The blended materials passed through a dryer and were heated

to about 180° Farenheit before the asphalt emulsion was applied and mixed. As the amount of moisture in the mixture, including the moisture in the emulsion, was limited to 6 percent, the aggregates were sometimes heated to 220° Farenheit. This permitted the work to proceed during inclement weather when mixed-in-place work would have had to be suspended.

The asphalt emulsion was tested and approved before it was delivered to the job, and 6 percent by weight was all that the particular aggregates needed to produce the desired results. Asphalt emulsions contain approximately 60 percent asphalt and 40 percent water and emulsifying agent and for that reason many people feel that the amount of emulsion in a mix should be increased so that the amount of residual asphalt would be the same as if a cutback had been used. That is unnecessary and often leads to unsatisfactory results. Emulsions were intended to be substituted for cut back asphalts on a gallon for gallon basis.

The base course mixture was transported to a Barber-Greene spreader and placed in layers not exceeding 2½-in. in depth; rolling was carried on by flat wheeled rollers until movement was observed under the roller. Although the job was not open to traffic, a considerable amount entered from the various cross roads and was not excluded. This rubber-tired traffic, plus contractor's equipment, afforded an additional and a very beneficial rolling. In most instances several weeks elapsed between the placing of subsequent layers and excellent bonding between each layer was noticed.

Densities of the compacted layers were determined at various locations during construction and found to be from 105.5 to 121.7 lbs. per cubic foot which is from 94 percent to 114.6 percent of the maximum density of the same material tested by the modified Proctor method.

Additional investigations were carried on by the personnel from the main soils laboratory in Albany. Soil densities of the sub-base were taken before and after calcium chloride was incorporated. Plate bearing tests were made on the subgrade using a 6-in. and a 12-in. diameter plate. These tests indicate that the pavement is a heavy duty Class A highway and will carry loads in excess of the legal limit.

This is an abstract of a paper by Mr. Fitts at the 1955 meeting of the ARBA.

New Grit Chamber Improves Sewage Plant Operation

The University of Florida Sewage Treatment Plant, when placed in operation in November, 1947, was the most complete and versatile plant in the state. Prior to the design of the new plant, an examination of the digestion chamber of the old Imhoff tank revealed very little grit accumulation. Thus the new plant was designed and constructed with no immediate provisions for a grit chamber. The fallacy of omitting this important unit was soon discovered. Problems caused by the presence of gritty materials in the sewage were very noticeable. Excessive wear on the ball check valves in the sludge pumps caused trouble; shoes on the flights of the primary sedimentation tanks rapidly wore out; and comminutor teeth had to be replaced more frequently than usual. In addition to these difficulties, quantities of grit were found to be accumulating in the digestion tanks. After only 18 months of operation, about 1000 cubic feet of grit were pumped out of the digesters. Since that time, the digesters have had to be pumped several times for grit removal and the other problems have continued.

The decision was made in late 1952 to install grit-removal equipment. Local conditions of terrain and lack of space made the installation of a conventional grit chamber impractical. A Chicago Pump Co. "Aerdegritter" was selected. Designs were submitted in 1954 and the unit was placed in operation in April, 1955.

At design flow, the theoretical detention time is about 10 minutes; the action of the unit does not, however, depend upon the detention time for its removal efficiency. Spiral flow is created in the tank by a row of diffuser tubes along one side above a hopper. Only one power unit is employed to drive a blower. The air is used for aeration and to operate an air-lift pump.

The Superintendent reports very satisfactory operation, with the unit removing about 0.5 cu. ft. of grit per day. This is less than the average daily accumulation for the first 18 months of operation, but campus maintenance and construction activities affect the short-time production.—*Sanitary Engineering Progress, University of Florida.*

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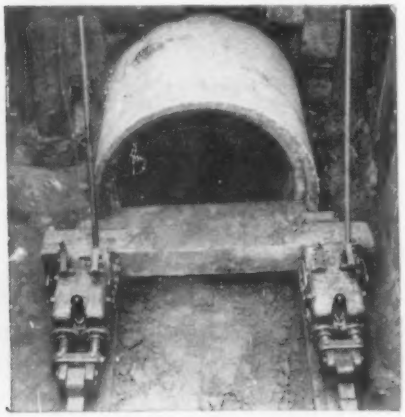

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Effects of Detergents on Water Treatment

This is an abstract of a paper at the recent AWWA convention which was presented by James C. Vaughn, Assistant Chief Water Chemical Engineer; Ralph F. Falkenthal, Water Chemical Engineer III; and Robert W. Schmidt, Water Chemist IV, all of the South District Filtration Plant, Dept. of Water and Sewers, Chicago, Illinois.

INCREASED USE of synthetic detergents in the last decade has created a number of problems for the water treatment industry. Detergents used in households pass with little change through the usual sewage treatment processes. Therefore, water supplies that are subject to considerable re-use, can in periods of low flow accumulate an appreciable detergent content. The AWWA task group organized to investigate the general problem of detergents classifies the problems presented as follows: (1) foam on settling basins; (2) tastes and odors; (3) coagulation and sedimentation difficulties; (4) iron removal difficulties; (5) foaming of finished waters; (6) quality deterioration in the distribution system.

Appleton, Wisconsin, was the first water supply to report troubles of this type. They began in the winter of 1948. The water would not coagulate properly and floc was formed that would not settle. A moldy or mildewy taste was created in the water at irregular intervals. It resisted removal by activated carbon and was more pronounced at the consumer's tap than at the plant. This condition still prevailed at Appleton in early 1954. Osawatomie, Kansas, reported similar troubles in early 1953. The raw water was clear, highly colored, and had a strong fishy odor. In the treatment plant the basins were covered with foam. Floc when formed would not settle. The filtered water was colored and had a strong, disagreeable fishy taste and odor. The most severe case of interference by detergents with water treatment processes was reported from Wheeling, West Virginia. In early December 1953, foam on the raw-water basin was over 4 ft. thick, and the foam on the 700 ft. wide Ohio River was from 1 to 2 ft. thick and extended from shore to shore. Serious coagulation difficulties were encountered. The floc would not settle and large particles held up by bubbles floated on the water. The water going through the filters was a light straw color, and the iron content of the finished water rose to over 0.3 ppm, with black water appearing all over the city. This discoloration was believed to be due to the manganese and iron oxides. These substances appeared to be held in a peptized state by the detergent.

After several months this situation at Wheeling extended all the way down the Ohio River as far as Evansville, Indiana, which experienced the same difficulties to a lesser degree. (There was still foam on the river at this point.) Ottumwa, Iowa, had similar experiences during 1953 and 1954. At the Chicago South District Filtration Plant, ammonium sulfate containing 1.25 percent alkyl aryl sulfonate as an anti-caking agent was tested at the concentrations used in plant operation. Interference with coagulation occurred, and objectionable tastes and odors were produced. The use of this particular anticaking agent was not permitted. It has since been learned that many chemicals used in water treatment contain detergents as anti-caking agents. At the South District Filtration Plant, such chemicals are not used.

At the laboratories of the South District Filtration Plant experimental work on the evaluation of methods of removal of detergents from water supplies has continued. As reported by Cross, the use of alum with activated silica was found to be helpful in coagulation at Appleton and Ossawatomie. Chlorine dioxide was helpful at Wheeling and Ossawatomie in reducing the taste and odors. More recent work at the South District Plant confirms these experiences but indicates that there are definite limits to the effectiveness of these methods of treatment. Activated carbon is effective in removing detergents but tremendous quantities are required, which makes the cost high. There is also a dosage limitation. Coagulation with chlorinated ferrous sulfate and lime is effective within limits. Bentonite used with the usual coagulating agents has a limited effect. A cationic material such as a primary rosin amine is very effective but cannot be used in potable water supplies, as it is a strong skin irritant. (The effectiveness of the alum-silica treatment at the pH of 8.80 is presumed to be due in part to the cationic effect of alum at the higher pH.) Inert materials, such as

finely ground silicon dioxide, and dolomitic limestone are completely ineffective. Precipitated calcium carbonate is quite effective. Partially settled sediment from the filtration plant sedimentation basins is very effective in removing detergents.

Plotting the data from the carbon and settled sediment tests according to the Freundlich equation indicates that the removal of detergents from water is a surface adsorption phenomenon. The results from the Bentonite and precipitated calcium carbonate tests tend to confirm this.

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APWA Congress Program

(*Continued from page* 125)

Health" by Dr. Mark D. Hollis, Asst. Surgeon General and Chief of the Division of Sanitary Engineering Services, U. S. Public Health Service; and "Right-of-Way Acquisition and Control Problems" by David R. Levin, Chief, Land Studies Section, Bureau of Public Roads, U. S. Department of Commerce. Following these papers there will be a case study devoted to "Developing a Refuse Collection Program". A paper on the subject will be presented by J. Henry L. Giles, Sanitary Engineer, Department of Public Works, Hartford, Connecticut, and further discussion will be held by a panel of commentators which includes Stanley I. Pinel, Management Engr., Office of the City Administrator, New York City; John Kingdon, Sanitary Engineer, Winnipeg, Manitoba, Ralph C. Taylor, Supt., Waste Collection Division, Cincinnati, Ohio; F. Dow Hamblin, Acting Director, Bureau of Sanitation, Rochester, N. Y.; Theodore C. Epping, Supt., Bureau of Sanitation, Chicago, Ill.: T. J. O'Leary, Supt., Sanitation Division, Boston, Mass.; Warren A. Schneider, Director, Bureau of Sanitation, Los Angeles, California; and William A. Xanten, Supt., Division of Sanitation, Washington, D. C. This highly qualified group promises a session of great value.

Inspection trips to be held Wednesday afternoon will give Congressionaires an opportunity to visit Milwaukee's water purification and sewage treatment facilities and also the City's new incineration plants. That evening the annual dinner will be high-lighted by the presentation of awards and introduction of the President-Elect. An entertaining show to be presented by the Local Committee will conclude the program.

NEW POLY-CIDE

Many municipal sewage plants create odor nuisances

IMPROVED **BROOKS POLY-CIDE** FOR MUNICIPAL SEWAGE PLANTS REDUCES OR ELIMINATES ODORS AT THEIR SOURCE

PRIMARY AND SECONDARY SETTLING TANKS. Odors produced here may be controlled by several methods depending on whether the odor is continuous or intermittent.

DIGESTERS. Odors seeping out around the digester can be controlled by spraying a water mixture of POLY-CIDE around the sides and top of the digester.

IMHOFF TANKS. Spray a water mixture of POLY-CIDE on and around the Imhoff tanks as required.

SLUDGE BEDS. Odors associated with sludge beds are usually short-lived. They are greatest right after fresh sludge has been added and taper off to a negligible value in a matter of several days. A POLY-CIDE water-mix should be sprayed over the surface of the bed immediately after the fresh sludge has been added.

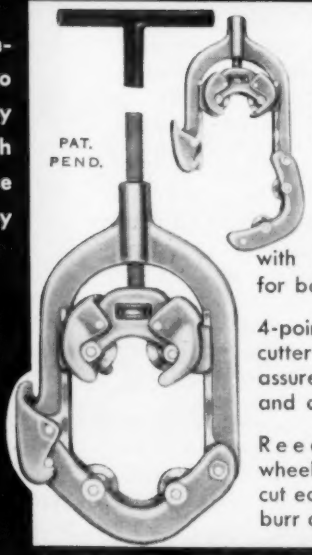
RECEIVING STREAMS AND RIVERS. POLY-CIDE dripped into the receiving body at a point slightly upstream from the discharge line will effectively control these odors.

Brooks Service Engineers are available anytime, anywhere.

BROOKS Chemicals, Incorporated
3304 East 87th Street, Cleveland 27, Ohio — Offices in Principal Industrial Cities

IF YOU CUT LARGE DIAMETER PIPE...
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
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It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

PUBLIC WORKS DIGESTS

The HIGHWAY AND AIRPORT Digest

Leaving Borrow Sites Sightly

California Division of Highways frequently finds it necessary, when constructing a road, to "borrow" material for fills. In doing so, it avoids, as far as possible, leaving open borrow pits; instead, it endeavors to leave the sites from which the soil is removed in such condition as to be actual or potential assets; in some instances they actually increase the potential agricultural productivity. In one case, soil was removed from a 261-acre unirrigated property in such a way as to make it suitable for irrigation, with the final surface grades planned in advance. The soil was removed with a crawler-type belt loader, working against a 2-3 ft. bank when possible.

"Borrow Sites, Not Borrow Pits." By Sam Helwer, Ass't. Dist. Engr., Calif. Div. of H'ways. *California Highways & Public Works*, June.

Crossing a Peat Bog

In carrying the Ohio Turnpike across a peat bog 350 ft. wide and 70 ft. maximum depth, the contractor hauled in 180,000 cu. yds. of sand and deposited it on the bog along the right-of-way. Its greater weight displaced the peat to the sides of the roadway, settling down to the hard clay below. The fill was then consolidated by jetting water into it through perforated pipe. A check on the settlement was maintained and the fill was found to settle about 2 ft. and reached approximate stability before the end of the season.

"On the Ohio Turnpike—Filling Biggest Bog Area." *Roads and Streets*, July.

Photogrammetric Maps for Planning Highways

In designing a 6.5-mile section of U. S. 101 in San Louis Obispo Co., the California highway department used photogrammetric contour maps and contour grading plans to prepare the contract plans. Thus, considerable survey and design time was saved, as excavation and embankment quantities were calculated from the contour maps with 5-ft. intervals. The total quantities so obtained differed by only 0.11% from those obtained by the standard methods, due largely to compensating errors. The method has since been employed very successfully in the design and construction of other projects.

"New Expressway." By E. J. L. Peterson, Dist. Engr. *California Highways and Public Works*, June.

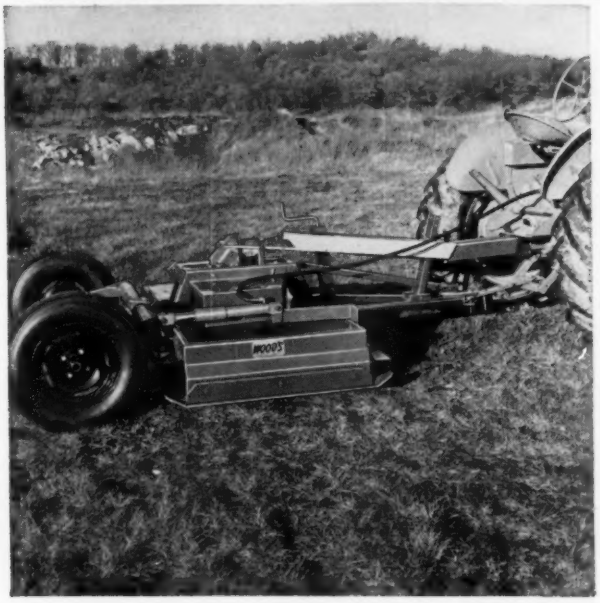
Button-Type Traffic Markers

The California Div. of Highways has been seeking a method for making the visibility of traffic lane marking as effective on rainy nights as the white stripes are during the day. They have developed a button-type marker composed of an epoxy-thiokol binder with titanium dioxide as a white pigment and glass spheres as the aggregate; and epoxy resin cement as an adhesive. These buttons could not be broken or dislodged by any traffic. These markers have been used to supplement

Fluorescent Street Lighting Adds Safety

MAIN STREET, the business heart of Forest City, N. C., acquired new attractiveness and added safety with a fluorescent street lighting system which supplanted an incandescent installation dating back some 35 years. The fluorescent system incorporates the most recent advances in street lighting design and layout. It is expected to maintain an average of 0.7 footcandle over a street surface that varies in width from 55 to 140 feet. Luminaires containing four 100-watt rapid start lamps are mounted at 28 feet 9 inches on Union Metal standards spaced from 50 to 100 feet apart, according to width of the street at that point. After the metal standards had been erected, Forest City's Municipal Water and Light Department expedited the installation through use of its own rigging equipment, specially built to enable workmen to mount three luminaires per hour.

Leaf Disposal Easy, Inexpensive with WOOD'S Tractor Mulchers



MODEL 80 (61 similar)

- ***FASTER THAN REEL TYPE***
- ***FASTER THAN SICKLE BAR***
- ***LESS EXPENSIVE TO USE***

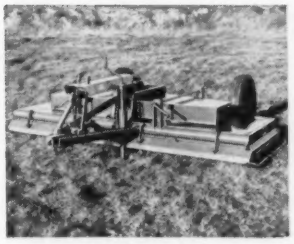
Wood's PTO-operated tractor rotaries do a clean and even job of mowing grass down to an inch high or cutting thick waist-high brush. Easy and accurate adjustment is handy on all models.

There are 12 models available in hydraulic lift or drawbar pull-type for any size tractor—42″ to 114″ cut—adjustable from ground to 14″ high. Wood's cutters mow, clip or shred and mulch leaves—close to trees, fences or buildings.

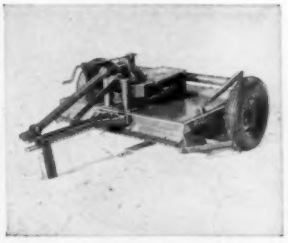
There are 1, 2 and 3 blade models. Blades overlap for clean cutting. Equipped with shock absorbing V-Belt drive, 3/16″ boiler plate housing, 15″ drop-center wheels or 8″ with non-pneumatic tires. All working parts enclosed.

Large Selection of Models

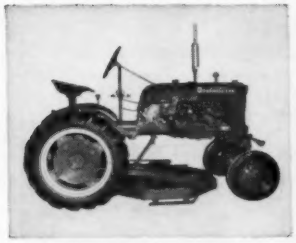
Model 42C, 42A—42″ cut, single blade, for Farmall Cub and Super A. **Model 42F**—Same as 42C but rear-mounted for the Fast-Hitch Cub. **Model 5**—60″ cut, single blade, for 2 plow tractors. **Model M5**—Same as 5 but mounts on 3-point hitches such as Ford. **Model 61**—61″ cut, double blade, for 2 plow tractors. **Model M61**—Same as 61 but mounts on 3-point hitches. **Model 80**—80″ cut, double blade, for 2-3 plow tractors. **MODEL O-80**—Same with off-set drive for working under low trees. **Model M80**—Same as 80 but mounts on 3-point hitches. **Model 114**—114″ cut, triple blade, for 3-4 plow tractors. **Model 114E**—Same as model 114 but with mounted engine for use with small tractors.



MODEL 114

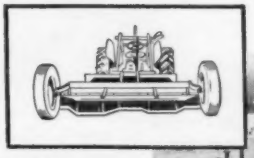


MODEL 5



MODEL 42C (42A similar)

MODEL M80 (M61 similar)



Leaf Mulcher available for Models 42F, 42C, 42A, 61, M61, 80 and M80.

FAST-HITCH 42F

FOR COMPLETE INFORMATION WRITE, WIRE OR CALL COLLECT

WOOD BROTHERS MFG. COMPANY

18509 **SOUTH 4th STREET** • **OREGON, ILLINOIS**

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the white lines, and during heavy rains they were highly visible both day and night, when the painted lines were difficult to see. They are quite expensive to make and the department is trying to find a satisfactory cheaper substance; so far they have found the most suitable to be a combination of white portland cement, glass spheres, and titanium dioxide as a white pigment. Although brittle, these buttons withstand heavy traffic when properly cemented to the pavement with the epoxy-thiokol adhesive.

"Traffic Line Markers." By H. A. Rooney and J. A. Cechetini, Testing Engineers. *California Highways and Public Works*, June.

Seal Coats Using Latex

The University of Kentucky Research Foundation has been investigating the use of rubberized binders in pavement construction; among others, combination of asphalt and Firestone synthetic latex R-504. After laboratory tests, a road application was made, which showed that the rubberized binder offers far greater resistance to loosening of the aggregate than do non-rubberized ones. The foundation developed a method of combining latex and asphalt by a dual spray bar technique instead of mixing them before use.

"Seal Coats With Latex Tested." By William H. Alcoke, Research Engr., University of Ky. *Roads and Streets*, July.

Photogrammetry In Highway Designing

Photogrammetry maps can be used for preliminary location and design; detailed location; computing earth quantities; studying drainage problems and culvert location; soil surveys; locating borrow pits and gravel deposits. Its use reduces the requirements for engineering manpower; saves in both time and money; and gives information much more extensive and detailed than is usually obtained by ground methods. Such work on the Pennsylvania Turnpike was five times as fast and cost one-fifth as much as conventional ground surveys. In the case of the Illinois Turnpike, it took only 15 days to deliver 5-ft. interval contour maps of the 465 miles.

"Photogrammetry Saves Time and Engineering Manpower." By Charles M. Hodell, V. P., Aero Service Corp. PUBLIC WORKS, August.

Plan for Future Turnpike Widening

In areas adjacent to large cities, the traffic on newly opened turnpikes has exceeded that anticipated in nearly every case, and the construction of additional lanes has been found desirable. The cost of such addition can be greatly reduced by providing a wide median in the original design, so that additional lanes can be built in it with a minimum of grading, drainage and changing of bridges and other structures. The Ohio Turnpike Com'n. adopted 56 ft. minimum width of median for Turnpike No. 1 and is planning turnpike project No. 2 for a 96-ft. minimum width. The construction with a 56-ft. median in the first turnpike cost only 6% more than the estimate for a 6-ft. median. Reference is made to the enormous cost of widening the New Jersey Turnpike, now under way, by adding lanes outside of the original construction.

"Plan Turnpikes for Inside Wid-

TWO BLAW-KNOX BASE PAVERS

Spread 800 tons per hour!

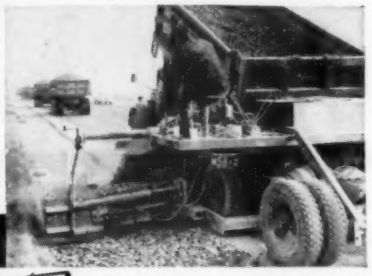
These two Model P-150 Base Pavers each spread 400 tons of No. 4 stone per hour on Maryland Route 40. On this 14 mile stretch they spread 12-ft. strips to a depth of 13 inches.

Paving base course to specifications on any highway or airport job is fast, accurate and economical with the big-capacity Model P-150. It lays large stone, slag, gravel, soil cement or crusher run aggregate evenly, *without segregation,* in widths up to 16 feet and depths to 20 inches.

Your Blaw-Knox distributor will gladly explain every feature.

BLAW-KNOX ROAD WIDENERS SPREAD CONCRETE WITHOUT FORMS, ASPHALTIC CONCRETE OR AGGREGATE

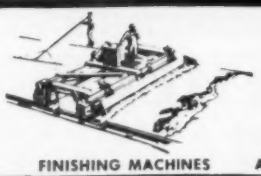
Profitable widening jobs are the result of speedy, efficient operation that builds earth shoulders at a 200 ton per hour pace...spreads and finishes concrete up to 1½ miles per day. Big savings on widening costs, because forms are not required for laying concrete. On a 10-mile strip, 6 feet wide, a Blaw-Knox Widener saved almost $20,000! Two models available to handle widths from 2 to 10 ft.



BLAW-KNOX BLAW-KNOX COMPANY CONSTRUCTION EQUIPMENT DIVISION PITTSBURGH 38, PA.

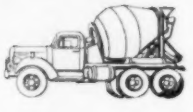
Ask about the **BLAW-KNOX** *"Complete Package"* of CONCRETE PAVING and READY-MIX EQUIPMENT

CONCRETE SPREADER-VIBRATORS



FINISHING MACHINES

AGGREGATE BATCHING PLANTS



HI-BOY TRUKMIXERS

Now's the time to mail this month's Readers' Service card.

ening." By J. Gordon McKay, Member Ohio Turnpike Com'n., *Roads and Streets,* July.

Summer Storing Of Rock Salt

Many communities practice storing rock salt during the summer to have it instantly available for winter use. Ohio starts getting its salt in May and stores it under cover, but most users store it in the open and cover it with about 6 in. of sand. A cap of 3 to 6 in. of unwashed sand will keep a pile in very satisfactory condition. A real need is a well-designed overhead bin capable of holding approximately 500 tons of rock salt, that can be installed at a low cost on a side-hill location, if available, to facilitate filling it and dumping from it to trucks.

"Winter Maintenance: Rock Salt for Bare Pavements." By S. James Duncan, International Salt Co. PUBLIC WORKS, August.

Other Articles

"Alternate Lane Paving For Tappan Zee Bridge on N. Y. Thruway." Roads and Streets, July.

"Is the Purchase of Today's New, **Bigger Equipment** Going to Pay Off?" Kenneth F. Park says Yes. Roads & Streets, July.

"Advance **Borings for Soils Data:** VII. North Dakota Has Own Formula." By A. W. Wise, State H'way Materials Engineer. Roads & Streets, July.

"The Application of Lessons Learnt in Airfield Construction (in England) to the **Construction of Concrete Roads."** By J. M. Laing, J. M. Fisher and E. U. Broadbent. Roads and Road Construction, June.

"Review of **Cement-Treated Bases** in California." By Carl Alzueta, Ass't. Engr. California Highways and Public Works, June.

How the County Unit System works in Kansas. "Good Roads Don't Just Happen." By James F. Meisner, Co. Engr. Public Works, August.

"Winter Means **Snow Plowing,** Sanding and Blizzard Fighting." By Pat Thomson. Public Works, August.

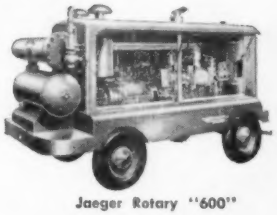
"Can **Destiny and Stability** Tests Be Matched With Service Behavior?" No, says a Highway Research B'd. committee. Roads and Streets, July.

"Rubber-Tired Rollers Help in **Street Resurfacing"** over old street car tracks in Minneapolis. Public Works, August.

"More Roads: Build Them One by One." By Arnold Nicholsen, Supervisor, Greenville, N. Y. Public Works, August.

Trenching 7 miles of street, this Jaeger "125" Roto ran two 80 lb. breakers to line-cut and break a 7" top of asphalt over brick—averaged 1200 sq. ft. per 8 hr. day—used only 1½ gals. of fuel per hr.

Jaeger "125" Rotary speeds street work



Jaeger Rotary "600"

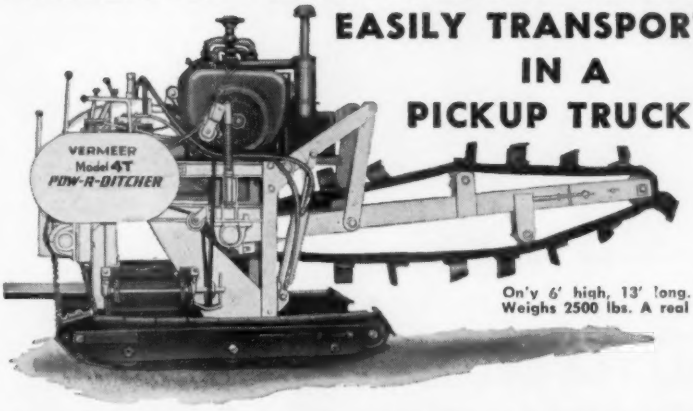
Instantaneous air delivery, under close and smoothly modulated control, enables the Roto 125 to maintain 100 lbs. minimum pressure under all demands up to 125 cfm. High efficiency results in slower speed operation, less fuel consumption, longer engine life than any other rotary. See your Jaeger distributor or ask for Catalog JCR5.

THE JAEGER MACHINE COMPANY 400 Dublin Ave., Columbus 16, Ohio

LOADER • PUMPS • MIXERS • TRUCK MIXERS • PAVING MACHINES

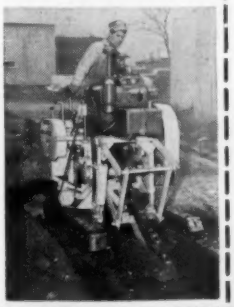
POWERFUL NEW "MIDGET DITCHER"

EASILY TRANSPORTED IN A PICKUP TRUCK



On'y 6' high, 13' long. Weighs 2500 lbs. A real workhorse.

ONLY 42" WIDE



VERMEER MODEL 4T POW-R-DITCHER Digs 6" to 14" Wide and 4½' Deep

Here's the "midget ditcher" they are talking about! The 4T POW-R-DITCHER is designed specifically for laying gas pipe, water and cable lines and digging foundation footings. Its narrow width makes the 4T ideal for those "tight spots." Digs at speeds of 1' to 17' per minute, depending on depth and soil conditions. Powered by a 15 or 25 h.p. Wisconsin engine. The 4T POW-R-DITCHER is built for service and answers the need for a small, rugged inexpensive ditcher. A self propelled and one-man operated machine. Has same size moving parts as larger POW-R-DITCHER models. **Write for name of distributor and complete information. Larger POW-R-DITCHER models also available.**

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Street Cleaning in San Francisco

S. J. SULLIVAN,

Superintendent, Bureau of Street Cleaning

From the Report of the Department of Public Works of the City and County of San Fransisco.

SAN Francisco's 1,626 curb miles of paved streets are being kept in a neat and presentable condition by the employees of this Bureau. The downtown shopping center, a world famous tourist attraction, is kept as clean as possible by blockmen who patrol their sections, from two to four times daily. In the outlying business and other congested areas the streets are serviced by blockmen. Parts of their routes are covered one or more times daily—other parts are covered once a week or when ordered cleaned by the District Director. There are now 132 block routes in the City and there is a need for at least three additional block routes in the Western Addition.

Our eight motor flushers travelled 71,648 curb miles. The function performed by the fleeet of motor flushers cannot be duplicated by any other method of street cleaning in such an economical manner. These flushers were not only used for flushing streets, they doubled as tunnel cleaners and were also used to supply water to irrigate the trees on the Van Ness Avenue center islands, and on other streets where there are trees maintained by this Bureau. Flushers, as usual, were dispatched to wrecks and to truck spillages. The fleet of flushers is equipped for use as auxiliary fire fighters by Civil Defense.

Ten motor sweepers serviced 32,407 curb miles of paved streets. The larger type motor sweepers are performing a good job in the outlying districts where the curb lines are not blocked by parked cars. Motor sweepers also performed the usual cleaning of 82 miles of curb along center islands. This is a function that cannot be performed economically or safely by any other means.

Some sections are not covered by blockmen or motor sweepers. These areas are serviced by ten sweeping crews each consisting generally of four to six laborers, one chauffeur and two lumpers supervised by a working Sub-Foreman. The amount of coverage needed is judged by the condition of the streets, density of population, etc. It can be readily seen that a first-class residential district will not produce as much litter as the congested areas and industrial sections.

Three utility trucks handle all miscellaneous jobs. One of their principal duties is the cleaning of tunnels. The cleaning of Broadway Tunnel has developed into a weekly project in order to keep the tunnel's glazed tile shining and the sidewalks clean. The unglazed tile in the crown of the Broadway Tunnel is cleaned by using a flusher which has been specially equipped by the Bureau equipment man and Shop No. 2 of the City Purchaser's Office. This unit is in the experimental stage in its use to spray a chemical detergent onto the unglazed tile. It is recommended that this tile be cleaned two or more times a year. Cleaning the entire tunnel, both bores, can be accomplished in two days. Traffic is detoured during the semi-annual cleaning of the crown but there is

"NEW LEADER" **Model DD All-Purpose, All-Weather**

TAILGATE SPREADER

for efficient ICE CONTROL!

The Model DD Tailgate Spreader answers all your spreading problems. In the winter months it is used for ice control, spreading sand, cinders, salt, and similar materials. In the summer months it is used for seal coating—applying sand or chips on newly laid oil and spreading calcium chloride for dust control. The Model DD Tailgate Spreader clamps on to the tailgate of an ordinary dump truck in minutes. A uniform and even spread is maintained at speeds from 1 to 35 m.p.h.

Write for Bulletin on the Model DD or other Highway Spreaders

HIGHWAY EQUIPMENT CO., Inc.

616 D Ave., N.W., Cedar Rapids, Iowa

Manufacturers of The World's Most Complete Line of Spreaders and Bulk Material Delivery Equipment

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no stoppage of traffic during the weekly cleanup of the lower sections.

The inauguration of the use of two-way radios in five vehicles in 1954 has improved the direction of activities in the field and has proved so valuable that a request for another unit in a litter patrol truck will be made in the next budget.

• • •

Controlling Filter Flies

A report from the California Spray-Chemical Corp., states that test work conducted by its Research Department in New Jersey last summer showed that practical control of filter flies could be obtained with weekly applications of a combination of Isotox Spray No. 200 and Vapotone XX Spray. Continued applications of the Isotox (containing lindane) gave good immediate kills and also tended to give some residual protection where the deposits accumulated. The Vapotone provided the extra punch that insured good control.

The recommended dosage is two quarts of Isotox Spray No. 200 plus one pint of Vapotone XX Spray per 100 gallons, using the whole 100 gallons for a 300,000 gallon per day plant. This is applied as a fine mist or fog over the entire area, coupled with residual application to walls, trees, and shrubs. For concentrate and fog machines, the materials are the same, two quarts of Isotox Spray No. 200 and one pint of Vapotone XX Spray in sufficient water to provide adequate coverage over the entire area. The dosage is adjusted accordingly for larger plants; treatments are started as soon as the first flies are observed in the spring and continued weekly as needed.

In response to a question by the Editor, the manufacturer states that results are independent of types of filters or volume application rates, so the above dosage holds for high-rate or low-rate filters. What is necessary is frequent space spray type application to control adult flies, coupled with residual application, where such applies, to surrounding shrubbery, grass and walls which offer refuge to the flies. The Vapotone gives knockdown results and the lindane provides some residual killing power. Sufficient Vapotone and Isotox must be used to keep the adult population low.

Care should be taken to follow label precautions in making applications, and used containers should be destroyed when empty.

everything you need for easy soil sampling

1. portable
Carry it in your car.

2. easy to use
No experience needed to operate.

3. dependable
Recovers accurate, undisturbed samples.

the ACKER SOIL SAMPLING KIT

More than 30 years of soil sampling experience all over the world has proven that this kit is the most versatile, portable collection of soil sampling tools you can buy!

LOW COST — NOTHING TO GET OUT OF ORDER —

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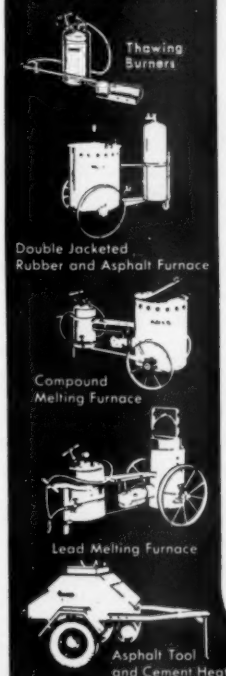
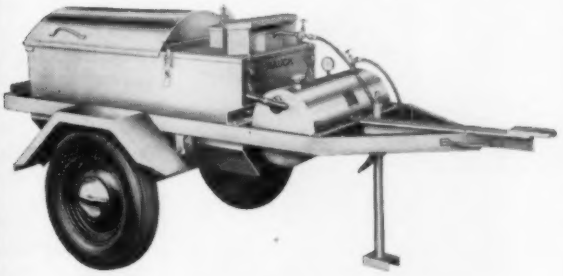
a complete line of Diamond and Shot Core Drills, Drilling Accessories and Equipment

HAUCK EQUIPMENT



Always Faster • Safer • Easier Melting of Tar • Asphalt



SPEED-MASTER KETTLES

New Advanced Design

Hauck fire box steel firing tube and heavy duty heating tube system. • Improved chassis frame for faster, easier mobility. • Faster melting and draw-off of material. • Comfort, convenience, cleaning and protection features. Sizes—55, 80, 115, 165,230 and 330 gallon capacities. Burn kerosene or bottled gas.

HAUCK MANUFACTURING CO.
117-127 Tenth St., Brooklyn 15, N. Y.

Write for Catalogs

Need more facts about advertised products? Mail your Readers' Service card now.

WILKINSON LINE LOCATOR

DESIGNED RIGHT
BUILT RIGHT

This precision instrument accurately spots every buried pipe and cable anywhere

It will indicate the depth too.

This substantial carrying case is available

The WILKINSON LINE LOCATOR provides low cost insurance against trouble.

Its dependability is recognized by leading utilities everywhere.

WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Drive
PASADENA 3, CALIFORNIA
Tel. SYlvan 0-4314

Soil-Cement Widening at Two Miles a Day Average

A. D. JANUARY,
Senior Resident Engineer,
Texas State Highway Department,
Wichita Falls, Texas

AN average of nearly two miles a day of soil-cement widening was constructed by the Austin Asphalt Co. on a 17-mile job on State Highway 79 in Archer and Young Counties, Texas. Soil-cement was built with ordinary equipment which was used, however, with extraordinary efficiency. The P&H traveling mixer, for example, was operated over the whole job at an average speed of 23.3 ft. per minute out of a possible top speed of 31 ft. per minute.

This road was originally constructed in 1928-29 to the then highest standards of highway design with 3 degree maximum curvature, 3.6 percent maximum grades, concrete culverts and bridges with 20-ft. roadway widths. The 18-ft. pavement was reinforced concrete of a 9″x6″x9″ section. These standards were well in advance of the Model "A" automobile era of that year.

Twenty-five years of continuous use with minor maintenance cost has justified this highway economically, but the Model "A" era did not last long. The greatly increased number of larger, faster vehicles using the road made modernization imperative. Comparative traffic counts of 1500 VPD justified only two-lane construction, so it was decided to widen the pavement to 24 ft. and the culverts and bridges to 44 ft. The average of the ten heaviest wheel loads per day was in the 10,000 to 12,000 lb. class.

We try to use local material whenever possible for this type of work in order to keep costs as low as we can. In this area sandstone was the only flexible base material available. The soil is a highly plastic clay loam.

Triaxial tests are used as the basis for flexible pavement design in Texas. Tests on two proposed sources of sandstone showed that when used as an unstabilized base one source was in the strength class of 3.2, requiring a 5½-in. cover and the other source was in the strength class of 3.4, requiring a 7-in. cover. Results of these tests and compressive strength tests on soil-cement made from the sandstone indicated that cement should be added to the sandstone to improve its stability as well as to decrease its permeability.

By correlating our experience with soil-cement and sandstone with these tests, we determined that a 6-in. soil-cement base on top of an 8-in. subbase of sandstone would give satisfactory results. The soil-cement was to be built of crushed sandstone with an 8 percent factor and the whole was to be covered with 2½ in. of hot-mix asphalt.

The subbase course was designed 8 ft. wide and the soil-cement base 7 ft. The bituminous surface was placed over the entire 18-ft. width of concrete and 6 ft. of the widening.

When the job was advertised, nine contractors submitted bids. The contract was let to the low bidder, Austin Asphalt Co. of Dallas. Total cost per mile for the 8-in. subbase and 6-in. soil-cement base with curing seal was $5,410.

Construction

The contractor had on the job: one 8-ft. wide P&H mixing machine partitioned to 7-ft. width; one Hercules cement spreader; four cement trucks—5-yd. dump; two motor graders; two 3,000-gal. water supply trucks; a 2,000-gal. pressure water distributor; two single drum sheepsfoot rollers; two HD-10 track type tractors; one pneumatic-tired roller; a large rubber-tired tractor; and a 2,000-gal. asphalt distributor.

The first construction step was to remove the old shoulder soil to a 14-in. depth and 8-ft. width on one side. This soil was used to widen the shoulder on the same side.

Per station, 30 cu. yds. of crushed sandstone were dumped on the concrete pavement at predetermined intervals near the open trench. This material was bladed into the trench in 2 to 3-in. layers, watered and pneumatic rolled until the total 8-in. subbase was completed. On top of this an additional 20 cu. yd. per station of crushed sandstone was placed to a 7-ft. width and rolled to give enough density to support traffic ahead of soil-cement processing. The contractor was careful not to compact the material so tightly that it would require scarifying ahead of the mixing machine.

Before cement was spread, the section was bladed to accurate

crown and uniform grade. A trench approximately 1 ft. wide was cut to subbase depth next to the old pavement to facilitate soil-cement processing at the pavement edge. This trench was cut by a 14-in. moldboard turning plow, heavily reinforced with ¼ and ½-in. boiler plate, attached to the motor grader scarifier assembly. The material removed was spread evenly over the remaining 6-ft. width.

Bulk cement was transferred from railroad cars to dump trucks near the center of the project. The amount of cement in each truck was held constant at 28 bbl. to simplify checking spreading distances on the road and the total amount of cement spread. Standardization of cement loads also allowed accurate forecast of additional loads needed, the stopping time and station number on cement spread near the end of each day.

Cement was spread on the material to be processed by a Hercules cement spreader. The spreader is pulled along by a dump truck which keeps it filled with cement. Cement spread was permitted no more than 1,000 ft. ahead of the mixer to guard against loss of cement because of rain or breakdown. Actually, this distance ahead was seldom reached because of the high mixing speed maintained.

Behind the cement spreader came the P&H mixer which pulverized the partially compacted sandstone, dry mixed it with cement, added the proper amount of water and left a uniform layer of soil-cement ready for immediate compaction.

The mixture was sheepsfoot rolled as soon as possible after mixing to secure maximum compaction. When all but the top inch or so had been compacted, a heavy shot of water was added to replace that lost by evaporation. The surface was then scratched by a shop-built harrow, shaped by the motor grader, and finished by a pneumatic-tired roller. After finish rolling, the section was clipped by the grader to conform to the concrete pavement edge, then rolled once again by the pneumatic-tired roller.

Another heavy shot of water was added to the surface ahead of the curing seal of 0.2 gal. per sq. yd. of RC-2 membrane. The RC-2 was effectively blotted within a couple of hours by traffic kicking over loose material that had spilled on the concrete pavement.

The road was kept open to traffic throughout construction and the widening was opened to traffic as

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soon as the curing seal was adequately blotted.

A 250-lb. hot-mix bituminous surface was placed over both the old pavement and the widening in two courses to complete modernization of this veteran road.

Much credit must be given to the contractor and his supervisors on the job, J. E. Robertson, vice president, and L. T. Piland, superintendent, for the excellent job. The project has proved to us the outstanding economy and simplicity of soil-cement construction. We expect to use it extensively in our district in the future. This is an abstract of a paper presented at the 1955 American Road Builders' Convention.

• • •

Plattsburg Diesels

(*Continued from page* 102)

fund. Such solvency is the result of careful planning and supervison—not high rates. In fact. a comparison of rates for residential consumers in the city of Plattsburg with the national average, as compiled by the Federal Power Commission, shows that Plattsburg is well below average. Despite the fact that the department is currently paying approximately 20 percent more for purchased power than it did last year, it has not raised its rates. The average cost of 250 kw. hrs. for residents of Plattsburg today is $5.90, while the national average for the same number of kilowatt hours is $6.78, almost 19 percent higher. Plattsburg rates now average 2.44¢ per kw. hr. for residential consumers; 2.70¢ for commercial; and 1.28¢ for industrial consumers.

The new Fairbanks-Morse engine was acquired to help improve this already robust financial picture at Plattsburg. In addition to providing needed additional standby protection, it was intended to provide low-cost, efficient power for peaking. Reduction of demand charges through diesel peaking service must wait, however, upon negotiation of a new power contract.

At the present time the Municipal Lighting Department is purchasing power at an average rate of 1.0¢ per kw. hr., including energy and demand charge, from the New York State Electric & Gas Corp., which took over the Saranac properties of the court-dissolved Eastern New York Power Co. in December, 1953. According to the terms of the new contract, the New York State Electric & Gas Corp. supplies power from its four hydro stations on the Saranac River up to 8500 kva., with all power over that amount and up to 25,000 kva. being supplied via a tie-in transmission line from the steam-hydro plant of the Niagara & Mohawk Power Corp. There is a $2.00 demand charge for all hydro power over 2100 kva. and a $2.35 demand charge for all steam power over 8500 kva. In addition there is a billing demand clause which specifies that the billing demand shall not be less than 83 percent of the highest kva. billing demand established in the preceding 11 months. Thus, with a peak demand of 10,694 kva. in January, 1954, (the plant's power factor that month was 91 percent), the department was billed for a minimum of 8,876 kva. for each of the succeeding 11 months of the year, whether or not its demand reached this level. With an average load factor of 60 percent, Mr. Niles estimates that this clause alone is currently costing the department an average of $2,000 per month.

If the department were able to use its new engine for peaking at the present time it would help reduce these demand charges considerably and would modify the effects of the billing demand clause. However, such use of the engine for peaking would have no effect on demand charges under the present arrangement. The current contract requires the city to sell all power generated directly to the utility, which in turn sells it back to the city at the same energy rate plus demand charges. In effect this would nullify the benefits of peaking. Before the current contract expires in five years the city hopes to secure a cheaper source of power.

The history of municipal power in Plattsburg goes back to 1935-1936, at which time an engineering survey was conducted and the people voted almost 2 to 1 to purchase the existing distribution system within the city's limits and to establish a Municipal Lighting Department. It was conceded that a fuel-oil-burning plant could not produce power for less than 7 mills per kw. hr. and a contract was signed as a result with the Eastern New York Power Company for the purchase of power at that rate from four hydro stations on the Saranac River.

City officials wisely felt that further steps had to be taken to protect the department's consumers against familiar water and hydro-power shortages. Accordingly, a standby diesel plant, equipped with three 1000-hp. diesel engines, was constructed in 1941 at the present site. With a generating capacity of 2100 kw. this plant was sufficient at that time to carry the city's entire load in times of emergency.

The city grew in size, however, and the standby protection afforded by the new plant gradually became less and less adequate. By 1948 the city's peak demand had reached 5400 kw., more than 2½ times the plant's 2100 kw. capacity. By 1952 the demand had increased so much that the outstripped plant could no longer handle the full residential load, not to mention its commercial and industrial loads.

A survey was subsequently conducted and the new Fairbanks-Morse engine installed. The demand has continued to rise since then and in January, 1954, it reached 9732 kw. To carry future peaks, space has

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ON a recent street paving job in Perry, N. Y., the Cipriano Gravel Co., Mt. Morris, N. Y., used an Adnun Jr. spreader to spread base courses and pave four streets, each 24 feet wide by approximately 1400 feet long. Using this machine it took three days for each street. On the first day 270 tons of stone to form a 3-inch layer over an 8 to 10-inch gravel course was spread with the machine. This base was penetrated with oil. On the second day a 1½-inch base of Colprovia was laid and compressed, using 170 tons of material. On the third day the Adnun Jr. was used to place a 1-in. topping of Colprovia. While this material is hard to handle because it doesn't run down into the raker bars like blacktop, Mr. Cipriano said that the Adnun Jr. did a good of spreading it.

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In the picture, Service Director Will A. Beans points to the roots as workers, left to right, Kenneth White, John Yokoboskie, and Dave Bachtel, hold the collection.

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been provided in the expanded plant for two additional engines of equal or greater size. The new engine is a Fairbanks-Morse, Model 38D8-⅛, 2-cycle, 10-cylinder, 8-⅛" bore and 10" stroke, opposed-piston diesel engine, rated 1600 hp. at 720 rpm. It drives a 1420-kva., 1136-kw., 3-phase, 60-cycle, Fairbanks-Morse alternator, which is direct connected to a 10-kw., 80-amp., 125-v., 720 rpm., F-M exciter.

Mr. Niles and Mr. Gottburg are the men principally responsible for the careful planning, foresight, and close supervision which has resulted in success for Plattsburg's Municipal Lighting Department. This plant, with its record of high dependability and efficiency, directly or indirectly protects an entire region in northeastern New York State and proves the wisdom of designing a standby power plant for heavy-duty, high-economy operation. R. C. Lyon is the plant's chief operator.

Ultimate responsibility for the success of the plant, of course, rests with Mayor John J. Tyrell and with the following members of the department's Board of Directors: Redmond J. Holland, Charles A. Leclair, Sr. (deceased), Alfonso Villoni, Robert C. Laravia, Richard S. Arbenger, and Elmore Brewster.

Miami Refuse Disposal

(*Continued from page* 89)

tra get collection service 6 days a week. All refuse collected in the packers is incinerated.

The Disposal Problem

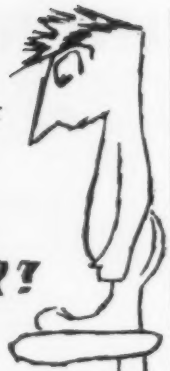
Incineration was the second problem to be solved. Miami previously had two incinerators. The largest of these, with a capacity of 280 tons and centrally located, was an outmoded unit built during the early 20's. It was designed for floor-dump operation, had virtually no storage capacity and had not been modernized, although enlarged several times; and it was expensive to operate. The second incinerator, a 60-ton unit similar in design to the older unit and built several years ago in the southwest, Coconut Grove section of Miami, is still in operation.

This combined incinerator capacity could not approach the daily refuse production of Miami and Miami Beach, whose refuse is also incinerated (for a charge of $3 a ton), as population and visitors increased each year. Refuse production increased steadily until it approached an average of 900 tons a day during 1954—a yearly total of about 280,000 tons, of which about 36,000 tons was from Miami Beach.

The initial solution to this problem was to burn refuse partially in the central incinerator plant, then haul the residue to landfills, which were old rock pits about 5 miles from the incinerator. This procedure not only was basically unsanitary but was expensive. The land in this area is solid coral rock to within a few inches of the surface, so sanitary landfill disposal is not practical for Miami.

Plans materialized in 1952; the new 900-ton incinerator was put under construction in February, 1953, and completed January 1, 1955. This incinerator is a Nichols 6-furnace plant, mechanically charged by two electric overhead cranes. The overall cost was approximately $3,300,000. It is centrally located, along with shops and offices of the Public Service Department at almost the exact center of the population area and about a quarter of a mile west of the old central plant.

It is estimated that the new incinerator will save at least $117,000 a year in labor in the disposal operation. It has eliminated 7 bulldozers used to push refuse into the charge holes of the old incinerator. It will



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reduce by at least $20,000 the $60,000 yearly truck maintenance and operation costs (in 1954) by eliminating bulldozers, can trucks and an estimated 70 percent of truck tire damage sustained because packers had to dump over charge holes in the old incinerator, where the constant overload put plenty of glass and other damaging objects under tires. It has reduced combustible incinerator residue considerably so the many disposal trips and the eight 18-cu. yd. trailers which formerly hauled residue to the landfills have been reduced accordingly. It also has reduced landfill requirements and expenses at the rock pit sites. In addition, expenses of operating the new incinerator will be low because the incinerator has been set up to sell steam to the County Hospital adjacent to it and to the City's Water and Sewer Department's water pumping station.

Additional data on the incinerator have been furnished by Nichols Engineering & Research Corp. The capacity is 900 tons per 24 hours with ability to consume 10 percent more than this. There are six 150-ton monohearth mechanically stoked furnaces, the plant being laid out in two systems of three furnaces each. Total plant steam capacity is 104,000 lbs. per hour. Because of the proximity to the County Hospital, very strict air pollution controls were written into the original specifications for the design. Accordingly, Nichols provided extensive spray chambers, impingement plates, eliminators and hydraulic means for the removal of the slurry of trapped fly ash and water.

Thus, this modern plant provides steam for the County Hospital and for the city pumping station and it also is equipped with anti-air pollution devices.

The new incinerator and the 74-unit packer truck fleet should enable Miami to achieve another step forward toward the goal of better sanitation at lower costs. The estimated $2,500,000 budget for the 1954-55 fiscal year includes garbage collection and disposal and also rubbish collection. This latter consists of shrubbery and tree trimmings, which are collected about every 3 weeks and which amount to well over 1,000 cubic yards a day. This rubbish is collected in open trucks which are loaded by hydraulic truck cranes and disposed of by burning in an Everglades landfill about 10 miles from the center of Miami.

The new facilities will help make Miami one of the cleanest cities in the South; but due to the rapid increase of permanent and transient population, it is necessary for Miami to be planning immediately on additional incinerator capacity and on more collection equipment.

• • •

Ground Water

(*Continued from page* 118)

withdraw a large amount of water from the storage relatively close to the well. A well obtaining water from a clean, coarse sand or gravel will have less drawdown, but will withdraw water from storage at greater distances from the well.

The drawdown or lowering of the water level in the well can be determined from an air line and gage installed in the well with the pump. Water rises in the air line to the same level as in the well proper. By pumping air into the line, the water is exhausted from this line and the pressure recorded on the gage is subtracted from the total length of air line in the well to indicate actual water level. Both the static and pumping water levels are determined in this manner. The drawdown necessary to produce the water pumped is a function of the permeability of the aquifer.

The specific capacity, or gallons per foot of drawdown, can be determined mathematically and is a figure for comparison of yield among wells. It is dependent on the permeability and the thickness of the aquifer together with the frictional resistance at the entrance to the well. It is obtained by dividing the total gallons per minute produced by the number of feet of drawdown of the water level in the well when pumping that quantity of water.

After pumping has ceased, the static water level to which the water rises can be measured with the air line as described above. If the water does not rise to its original level after pumping stops, within a reasonable limit of time, over-pumping is indicated. Safe yield is indicated if the recovery between pumping periods is complete.

Underground Storage

Under-ground storage can be utilized in many places where surface storage would be extremely costly. In recent years, there has been an increasing trend toward regarding the permeable rock materials as places where water can be stored rather than merely as places where water is stored by nature. Consequently, a water well or wells,

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may be used to augment the existing water supply by providing storage of water in addition to the normal above-ground storage when the demand for water has grown greater than the ability of the distribution system to deliver it; and by locating wells at strategic points along a feeder line, additional water and pressure can be provided to meet expansion, growth and increased water demand.

Studies of the distribution system, of the areas of water demand, and plans for expansion are needed to determine the most feasible site for the wells. It may be most economical to plan a series of wells at strategic points because of pipe sizes. Furthermore, a distribution of wells will be a decided advantage in civil defense and in the event of atomic warfare, toward maintaining the supply. Atomic radiation is unlikely to affect the well water supply whereas the surface water supply may become contaminated or the treatment works destroyed.

When new wells are connected into existing mains, complete sterilization with chlorine is of vital importance. Aside from disease types of bacteria, others of the iron precipitating type may be introduced from new lines laid and eventually contaminate the entire system.

• • •

Propane Cuts Costs

(*Continued from page* 108)

pane costs 14 cents a gallon. But, with the latter fuel, consumption is just about half as high—5.5 gallons per eight-hour shift, as compared with 10 or 11. These savings in fuel and maintenance costs add up to at least $1,000 per vehicle per season, according to Mr. Konefes.

Propane has produced at least two other important savings. Because of the need for extensive maintenance in the field when the rollers were operating on gasoline, three engineers were required. Now, with the units on propane, it is possible for the department to get along with two. Payroll costs have been cut $7,000 a year.

Because the rollers had such an appetite for gasoline, a fuel truck had to make the rounds each working day. Now, a truck goes out only once a week, slicing about $120 a week off expenses.

Cost of the conversion was $300 per unit. The investment in parts and fuel tanks totaled $260, and the remaining $40 went for labor. All the work was done in the shops.

Mr. Konefes' attitude toward pro-

pane is indicated by his plans for the future. By the end of the summer, the rest of the tool heater fleet —seven units—and all the other road rollers—11 of them—will have been converted. Then, two shop cranes, two truck tractors used for hauling garbage trailers, and three garbage collection trucks will be switched. If propane turns in the same kind of performance it has on the tool heaters and road rollers, the city's whole fleet of 375 garbage trucks and 22 truck tractors will be switched to propane.

• • •

Milwaukee's Incinerators

(*Continued from page* 93)

ously and the quantity of air is regulated by dampers on the intakes and controlled from the stoking floor. There is no modulation for the over-fired air fans. They are either on or off, depending upon the furnace temperature.

The quantity of air brought in through all the unit heaters is about 10 pounds per pound of refuse and the additional air required for burning comes through the over-fired air fans and leaks through the cracks and other openings in the building. On the stoking floor there is a draft gage and the intake dampers on the unit heaters are positioned according to the draft in the building.

There are two 200 BHP Union waste heat boilers each equipped with auxiliary oil burners, induced draft fans, etc. The induced draft fans are driven by 20 hp motors through variable speed drives and fluid couplings. The speed of the fans is manually controlled according to the load on the boilers. The oil burners are as yet not installed but when they are they will be used only when the outside temperature is less than 45° F and the incinerators are not operating. These boilers are larger than those at the Green Bay Avenue Plant because this incinerator plant will have to furnish heat for several other City buildings that will be built on this site.

The chimney is similar to the one at Green Bay Avenue and was built by the same chimney contractor. It has an internal diameter of 118 ins., is 175 feet high, and is built of reinforced concrete with an air space between the concrete and the fire brick lining. A bricked up opening on the west side about 50 feet above grade was provided in case additional fly ash eliminating equipment and an induced draft fan would be required.

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PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly **September, 1955**

All Weather Bituminous Mixer

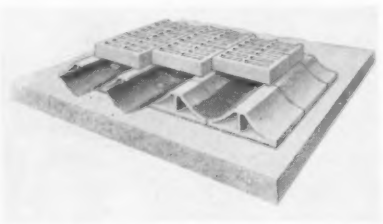
Trail-O-Patcher is an all weather bituminous mixer engineered to produce a full range of hot and cold mixes for highway maintenance and repair, paving driveways and parking areas, resurfacing, patching, base material stabilization and similar operations. It has a 4 cu. ft. hopper, easily filled directly from the rear of a truck. Bitumen can be pumped into the pugmill from a kettle or supply tank or added in the aggregate hopper. Replaceable abrasion resisting hardened steel liner plates protect the pugmill wearing surfaces. Two 6-K Littleford torch type burners provide the heat for drying and mixing. The mixer can be trailed behind a maintenance truck. Its capacity is approximately 4 tons of hot mix per hour depending on materials used and the moisture content of the aggregate or 8 tons of cold mix. For more information, write to Littleford Bros., Inc., 457 E. Pearl Street, Cincinnati 2, Ohio, or circle **No. 9-1** on the coupon.

Model "400" Trail-O-Patcher is highly portable, handles hot or cold material

Two-Piece Trickling Filter Underdrain

Ceramifilter, a two-piece filter block eliminates the need for hand placement of filter stone and provides also larger runoff channels and aeration openings. With Ceramifilter, media can be deposited by clamshell at a saving of about $4.25 per ton of stone over the cost of hand placement. This is possible because Ceramifilter is made with channel blocks and center supports designed to withstand high stresses. Upper grill blocks are a full three inches thick and remain undamaged when filter media is loaded by clamshell. Ceramifilter has maximum openings for aeration. The upper grill blocks have eight openings totalling 44.3 percent of the top area. Channels are extra-deep. Fiber paper strips, placed in the drainage channels before the upper grill block is deposited, catch any chips and "flats" which may fall through the grill opening. When the strips are pulled out, they carry all the chips, "flats" and "fines" out with them.

Ceramifilter floors far exceed the engineering requirements set up for filter floor service, with a safety factor of 10 times the strength required for the upper grill block and three times the strength required for the lower channel block by A.S.T.M. standards. The channel blocks provide extra-large drainage channels for fast run-off—30½ square inches of drainage area per foot of width. Detailed information on Ceramifilter from James A. Cross, Representative for Design Engineering, 1321 Queen St., Pottstown, Pa., from Straitsville Brick Co., New Straitsville, Ohio; or by circling **No. 9-2** on the coupon.



Ceramifilter underdrains, showing how fiber paper strips catch stone fines

Semi Vehicle-Actuated Traffic Controllers

A new line of semi vehicle-actuated traffic controllers has been announced by General Electric. This includes the Type V electronic controller, and the Type W electromechanical controller. Two features are included in the Type V controller: 1—A built-in directional detector relay which, when used in conjunction with pressure-sensitive detectors, detects only those vehicles approaching the signal, eliminating the need for separate directional detector relays. 2—A variable initial traffic interval enabling the controller to store information on the number of vehicles awaiting a red light and to provide just the right amount of "green" to let them pass. This reduces delay on the main traffic artery to a minimum. The design of the Type W includes only four basic components—two time—delay relays, a timing dial and signal switches. For details write General Electric's Outdoor Lighting Dept., Lynn, Mass., or circle **No. 9-3** on the coupon.

BUCKET LOADERS WORK FASTER AND SMOOTHER WITH ACCUMULATOR

The answer to bucket loader shock and vibration can be found in the shock-absorber action of the Greer accumulator. This hydraulic component permits faster, smoother bucket control operation, reduces structural strain and lessens operator fatigue. The accumulator connects to the main pressure line with pipe-T and hose between the lift cylinders and the control valve. Some manufacturers of bucket loaders are offering this as standard or optional equipment. For details write Greer Hydraulics, Inc., N. Y. International Airport, Jamaica 30, New York, or circle coupon **No. 9-4.**

New Vinyl Protective Coating

A new vinyl protective coating has been developed by Amercoat. The new coating can be applied at a thickness of 10 mils in a single cross-spray coat, thus providing a heavy film previously obtainable only by multi-coat applications. An additional feature is that the coating does not flow away from edges and sharp corners. Complete information from Amercoat Corporation, 4809 Firestone Boulevard, South Gate, California, or circle coupon **No. 9-5**.

Chemical Fume Hood

Metalab announces new "Metal-Aire" Modular type fume hoods made in all standard sizes in open and closed types. These fume hoods are fabricated in single and double compartments, double hung sash type, and a variety of special arrangements. The superstructure is full double wall construction, lined on the interior with asbestos composition. Air handling and balancing is by means of adjustable baffles. Stainless steel framed safety glass sash operates on ball bearing with nylon rollers. For information write to Metalab Equipment Corp., 214 Duffy Ave., Hicksville, L. I., N. Y., or circle coupon **No. 9-6**.

Trip Blade Snow Plow is Reversible by Cab Controls

A new Frink power reversible, trip blade, snow plow has been introduced by Frink. This can be used to bull-doze, or can be angled 10, 20, 30 or 37 degrees, to right or left. The moldboard is welded, of #10 USS gauge steel and the cutting edge reinforcement is a structural angle. Scuff shoes are bolted at each end of the moldboard as protection when plowing next to curbings. The reversing mechanism is controlled by one lever in the cab of the truck. The pre-loaded trip spring mechanism with linkage to the moldboard permits a smooth swift tripping action when an obstruction is encountered and a quick easy return to normal plowing position when it is passed. The snow plow is now available in three models

Sturdy reversible plow is adaptable to needs of cities, counties and states

with either manual or power hydraulic reverse. For information write to Frink Sno-Plows, Inc., Clayton, N. Y., or circle the handy coupon **No. 9-8**.

Mobile Communications Center for Civil Defense

A new unit designed and built by Instruments for Industry, Inc., provides a much needed "nerve center" in the event of disaster. The unit operates on the radio frequencies presently used by amateur radio operators, and the mobile units of municipal Police and Fire Departments, taxicab companies and other services. Built into a fiberglas-insulated van-type truck, the unit carries a rack of two-way handy-talkies for radiological monitoring teams as well as complete radio equipment on a series on major and minor frequencies. Thus one unit can cover two services in the event of necessity. All antennae are mounted in the roof of the truck and power is supplied by a 10-kw gasoline driven generator which is towed on a trailer. For more information, write Industry, Inc., Mineola, N. Y., or circle coupon **No. 9-9**.

Wood Brothers Introduce New Rotary Mower-Shredder

A rotary Mower-Shredder has been introduced by Wood Brothers. The Model 42G is made to mount underneath the Allis-Chalmers Model "G" Tractor and it shreds a 42" swath. It is ideal for mowing fence rows and road shoulders; and a leaf mulching attachment is available. The mower is V-belt driven and the height of cut is adjusted by the lift mechanism of the tractor. Information and specifications from Wood Brothers Manufacturing Co., Oregon, Ill., or circle **No. 9-7.**

Controls Rate of Flow of Filter Effluent

A new meter which measures the flow of effluent from a water treatment filter without adding to the head loss is announced by Foxboro. The new meter requires no restriction in the line, no pressure taps and no straight runs. Used in filter control, it consists of a transmitter (an electromagnet surrounding a length of non-magnetic pipe), a flow recorder-controller located in the operating gallery, and a pneumatically operated butterfly valve controlling the effluent. Features include a linear flow scale, head loss no greater than in any equivalent length of pipe, unlimited maximum velocity, measurement of reversing flows and high accuracy unaffected by turbulence or changes in viscosity, density or conductivity. Write The Foxboro Co., Foxboro, Mass., or circle **No. 9-10** on the coupon.

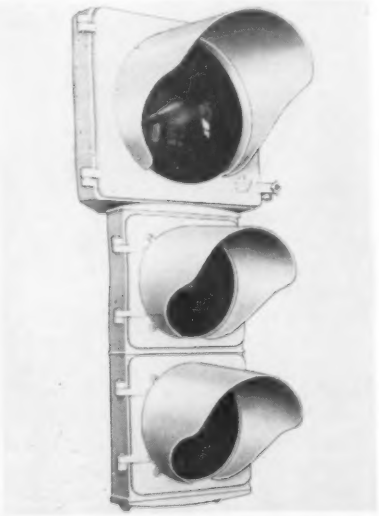
Load-Lugger Refuse Containers and Hoist Body Truck

Bulk material handling equipment features leak-proof refuse collection containers

The Load Lugger hoist-body is a truck body wth a flat bed and a pair of hydraulic-powered hoisting arms for picking up, dumping, and putting down Load Lugger containers. It is easily mounted on any standard truck chassis of suitable capacity, and is operated by the truck driver from his cab. Standard hoist-bodies handle pay loads of up to 18,000 pounds, and special models handle more. Standard Load Lugger containers hold from 1½ to 14 cubic yards; special models more. When not handling containers, a truck equipped with the hoist-body can be used to carry materials or equipment on its flat bed, handling heavy objects with its hoisting arms. The containers are low, easy to load. Models may have leak-proof bottoms and are dust-proof, rat-proof, fly-proof, and almost odor-proof. More information from Brooks Equipment Mfg. Co., Knoxville, Tennessee, or circle coupon **No. 9-11.**

12" Traffic Signal Beam is Visible a Mile Away

A new traffic signal designed to increase safety in rural areas and high speed highways, has been announced by Eagle Signal Corp. The optical unit is 12 inches in diameter and sends a beam down the highway that is clearly visible for over a mile. Each section weighs only 17¾ pounds. Designed to mount on existing standard signal brackets, the unit may be furnished with prominent red light, or as a complete signal with 12-inch lenses for all sections; red, green, amber and arrow are available. Sections are easily assembled. More information from Eagle Signal Corporation, Moline, Ill., or by circling coupon **No. 9-12.**



Big red lens commands attention as it beams its signal a mile down the road

A Compact 2-Way Radio

A compact 2-way radio which operates from 6, 12 or 24-volt dc. or 115-volt ac. sources without a separate power supply has just been announced by Industrial Radio Corp. It may be used in vehicles, mobile industrial equipment, aircraft, as a base station or, when operated with a 12-volt aircraft-type storage battery, as a portable unit. It is 10" wide, 9" deep and 5" high. The loud speaker and power supply are built-in; microphone, antenna and mounting frame are standard equipment. Accessories include roof-top, car window and ground plane antennas. As current requirements are very small, no changes or additions to ordinary vehicle electrical systems are necessary. FCC and Civil Defense designations are carried. Write to Industrial Radio Corporation, 428 N. Parkside Ave., Chicago 44, Illinois, or circle coupon **No. 9-13.**

New F&P Chlorine Solution Flow Indicator

A new low-cost, low-maintenance indicator for measuring flows of chlorine solution through lines from 2 to 6 ins. in diameter has been introduced by Fischer & Porter. The chlorine solution indicator is based on an orifice with a by-pass line. Easy installation, simplicity of maintenance, and an easily-read linear percentage scale are features. It is completely resistant to chlorine solution and withstands working pressures up to 100 psi (gauge). The standard unit creates a pressure drop of 50 inches water at maximum flow. More information from Fischer & Porter Company, Hatboro, Pa., or by circling coupon **No. 9-14.**

New Self-Propelled Power Cranes and Excavators

The Schield Bantam Company has introduced a self-propelled ⅜-cu. yd., 6-ton shovel-crane. It has 12,000 lbs. lifting capacity and an outside turning radius of 19½ feet, with ability to work in tight quarters. An important feature is two-speed independent travel which allows the operator to work the upper deck machinery and travel at the same time. The steering mechanism and brakes are controlled hydraulically. Attachments include crane, clamshell, dragline, shovel, trench hoe, magnet, grapple, pile driver and backfiller. Write the Schield Bantam Company, Park Street, Waverly, Iowa, or circle handy coupon **No. 9-15.**

Self-propelled crane-excavator has a ⅜-cu. yd. capacity and a 6-ton lift.

Power Finegraders Handle Curve Transition Sections

Power finegraders with a new Grade-A-Curve feature, which makes the fine grading of highway curve transitions a continuous operation, have been announced by Gar Wood. Finegraders with the new Grade-A-Curve feature have an I-beam structural frame which is hinged at the center of the machine, so that an accurate, ratchet-type control adjustment with graduated steps raises the frame and cutting blades at the center for cutting a crown, and lowers them to cut on the level without stopping the machine for adjustments. This machine eliminates the fine grading of curve transition sections by hand and with motor graders. For information write Gar Wood Industries, Inc., Wayne, Michigan, or circle coupon **No. 9-16.**

Curve-A-Grade feature simplifies fine grading of highway curve transitions

Cold Water Pipe Covering Stops Condensation Drip

A permanent solution to the common—but often ignored—problem of cold water pipe "sweating" has been announced by the J. W. Mortell Company. A new and improved plastic cork pipe covering, commercially known as NoDrip Tape, is said to stop permanently cold water pipe drip without the aid of "extra" vapor seal tapes or overwraps. It is a complete, protective covering and offers a built-in moisture barrier which will resist water absorption under the most extreme variations of temperature and humidity. It is self-adhering and can be applied snugly and evenly without seams or ends coming loose to allow entry of moisture-filled air. No metal bands, brads or clips are needed. Joints, valves, etc., are covered as easily as straight pipes. More from J. W. Mortell Co., Kankakee, Ill., or circle **No. 9-17** on the coupon.

New Cyanamid Reagents Accelerate Settling

American Cyanamid announces the development of a new group of synthetic polymers, called Aerofloc Reagents, which have the ability to agglomerate finely-divided solids in suspensions so that settling and filtration are accelerated. Small quantities of Aerofloc Reagents will accelerate the settling of raw sewage and addition of quantities at the digestion stage will speed up the settling of colloidal suspensions from the settled sewage, thereby producing a clearer supernatant overflow. More information from the Mineral Dressing Department, American Cyanamid Company, 30 Rockefeller Plaza, New York 20, New York, or circle coupon **No. 9-18.**

McGee 3/4 Yard Scraper for New Ford Tractor

This new ¾-yard hydraulically controlled drag scraper is actually five implements in one: 1—Scraper. 2—Scarifier. 3—Scarifier and Scraper (in combination). 4—Floater and Finisher. 5—Backfiller. It is specifically designed for the new 600, 800 and NAA Series Ford tractors. The 7 scarifier teeth may be latched up out of the way or let down to rip up the hardest ground. In addition, there are two outside stationary teeth which serve a double purpose: 1—To protect the bowl ends. 2—To allow the operator to work close to foundations and forms. Grading can be done with a fine degree of accuracy—both forward or backward—due to angling or power tilting of the scraper. The scraper has a high above-ground clearance of objects or for working off the tops of dirt piles. More from Leland T. McGee Manufacturing Co., 410 Dixon Avenue, Compton, Calif., or circle **No. 9-19.**

Shawnee Scout Model 70 Ditcher

The adaptation of the Scout Model 70 Ditcher for installation on TerraTrac "300", "400", and "500" crawler tractors is announced by Shawnee. Several new features have been added, such as individually controlled, self-leveling hydraulic outriggers which keep the unit level regardless of the slope of the ground. Removal of four bolts and two pins permits removal of the ditcher in a few minutes. It digs 12 feet deep, loads 8½ feet high, and reaches 14 feet. Additional information from Shawnee Manufacturing Company, Inc., 1947 N. Topeka Blvd., Topeka, Kansas, or by circling coupon **No. 9-20.**

Wagner Backhoe Digs 12 Feet Deep

Wagner W30 Backhoe features long reach, greater cutting depth and a wider swing

The Wagner W30 backhoe permits digging anywhere inside a 165° arc and has a reach of 16 ft. and a digging depth of 12 ft. It can be installed on Ford, Fordson Major, Ferguson, John Deere, Oliver, International Harvester and Cockshutt tractors. It is powered by an independent hydraulic system, driven from the front of the tractor crankshaft; and, when operated with a loader, no transfer valves or changes to the hydraulic system are necessary. Also featured, is the twin hydraulically controlled stabilizers. For details write Wagner Iron Works, 1905 South First St., Milwaukee, Wisc., or circle **No. 9-21.**

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CINCINNATI

Turbocharged, Rubber-Tired, 165 Horsepower Dozer

A rubber-tired dozer powered by a turbocharged diesel engine has been introduced by Construction Machinery. It has 165 hp rating, a capacity of 2¾ yards, and a road speed of 27 mph. Four-wheel drive and rear-wheel steering permit full power on wheels even while turning. Among operational advantages are hydraulic controls which facilitate easier maintenance, a bowl which can be tilted by the operator while the machine is in motion and

Powerful Turbo-Dozer has a big 2¾-yd. bowl operated by hydraulic control

the ability to move under its own power over the highways. The Turbo-Dozer features a power-shift transmission, a heavy-duty torque converter which automatically provides up to 3 to 1 torque multiplication and planetary wheel drive axles. Wheelbase is 7 ft. 4 in., ground clearance 14½ in. and weight 27,000 lbs. More data from Construction Machinery Division, Clark Equipment Company, Benton Harbor, Mich., or circle coupon **No. 9-22.**

Trash Collector Made Dustproof

A device to eliminate discharge of dust has been developed for its Motorized Scavenger by Good Roads Machinery and the attachment will be offered as optional equipment with all new units. It mounts above the unit's power plant. The dust trap attachment filters and washes exhaust air; and the trap can be bypassed, if desired, when collecting wet or otherwise dust-free material. The Scavenger, redesigned to make provision for the dust trap and optional hydraulic controls for intake hose positioning, operates like a giant vacuum cleaner to suck up bottles, cans, leaves, papers, rags, and other debris. It can be mounted on a truck chassis or heavy-duty trailer. Its 12 cu. yd. hopper is hydraulically dumped. For details write Good Roads Machinery Corp., Minerva, Ohio or circle coupon **No. 9-23.**

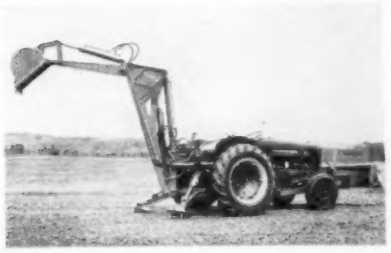
Mechanizing the Job of Street Cleaning

The Obeco Tornado street cleaner is a truck or trailer body, equipped with flexible suction hoses that can go under parked automobiles to reach leaves or refuse. The main suction hose is constructed of 14-inch diameter Spiratube. It is a lightweight, extremely flexible ducting ideally suited for the continued flexing, stretching, and turning that the application requires. The hose is controlled by the operator by a series of chains which permit regulation of the angle and height of the hose intake. An auxiliary hose, made of 6" Spiratube, and equipped with a long aluminum nozzle, is used to reach the hard-to-get-at spaces. Ten feet in length, the auxiliary can be placed on a carrying rack when not in use. Information from Flexible Tubing Corp., Guilford, Conn. or circle **No. 9-24.**

Flexible ducts can reach under parked cars to speed street maintenance work

Pippin Excavator For Mounting on IHC 300 Utility Tractor

A new excavator and angling bulldozer for mounting on the International 300 Utility tractor has been announced by Pippin. The new excavator digs to a depth of over ten feet and loads truck to a height of nine feet with back hoe bucket and twelve feet with shovel bucket. The angling bulldozer blade is available with angling bracket for quick angling 12½ or 25 degrees left or right. For details write Pippin Construction Equipment, Inc., White River Junction, Vermont, or circle coupon **No. 9-25.**



This new model of the Pippin Excavator mounts on IHC "300" tractors

Speedall 2½ Cu. Yd. Tractor-Shovel

A Speedall tractor-shovel, announced by Pettibone Mulliken, features power-shift transmission, torque converter and four-wheel drive planetary axles and a 2½ cubic yard bucket. In addition, 1¼ and 1¾ yard models are available. Two levers on the steering column hydraulically shift the tractor-shovel four speeds forward or four speeds reverse. The bucket is designed for a 30-degree tilt-up from ground position and an automatic device levels the bucket. Either gasoline or diesel engine and numerous accessories are available, including a snow bucket, lift fork, crane hook, V and one-way snow plow and a bulldozer blade. For further information write Pettibone Mulliken Corp., 4700 West Division St., Chicago, Illinois, or circle **No. 9-26** on the coupon.

Personal News

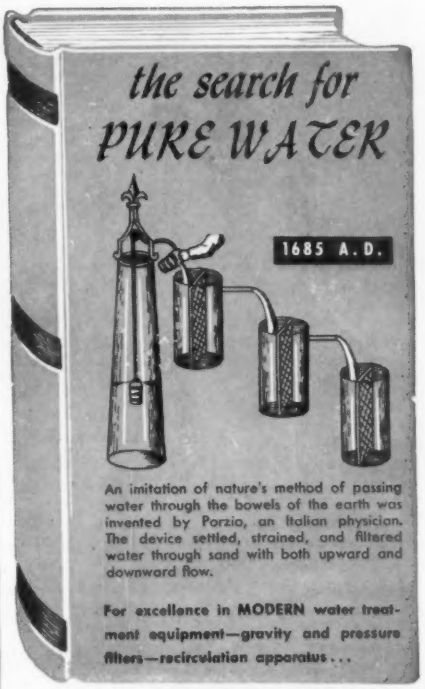
Roy F. Weston, who has been sanitary engineer for the Atlantic Refining Co., has resigned and will devote all of his time to his consulting work. His firm is Weston, Eckenfelter & Associates. He will work out of Newtown Square, Pa., and Mr. Eckenfelter out of Leonia, N. J.

Jack Graham is now a partner in the firm of Leggette, Brashears & Graham, consulting ground water geologists, with offices at 551 Fifth Ave., New York.

Ellis Tisdale, well and favorably known to most sanitary engineers, has retired from the Public Health Service and is now a Director of the Interstate Commission on the Potomac River Basin, with headquarters in Washington.

Harry Faber, it is officially announced, has joined the Public Health Service and will appraise and evaluate the research program in sanitary engineering.

Arthur W. Tews has resigned his position as City Engineer of Duluth to accept the post of Assistant Chief Engineer for the City of St. Paul, Minn.


the search for
PURE WATER
1685 A.D.
An imitation of nature's method of passing water through the bowels of the earth was invented by Porzio, an Italian physician. The device settled, strained, and filtered water through sand with both upward and downward flow.
For excellence in MODERN water treatment equipment—gravity and pressure filters—recirculation apparatus . . .

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

ROBERTS FILTER MFG. CO.
640 Columbia Ave.
Darby, Pa.

H O D A G

The Nation's Largest EXCLUSIVE Manufacturers of ANTIFOAM AGENTS

Now, at absolutely no cost or obligation discover how your plant can be made foam free, like the Benton Harbor Sewage Treatment Plant.

Fill out the coupon. A Hodag Chemical Engineer will survey your plant. He will recommend a custom formula for your specific needs. You will receive enough of this special Hodag formulation, free, to run conclusive tests. Prove to yourself how simple and economical it is to kill foam.

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7247 N. Central Park
Chicago 45, Ill.

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Address _____
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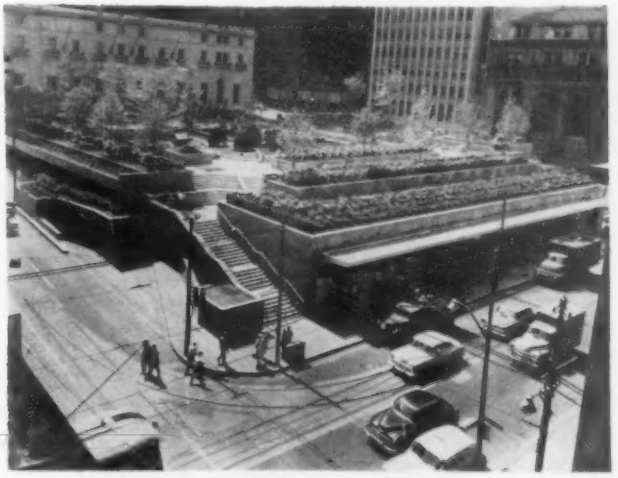
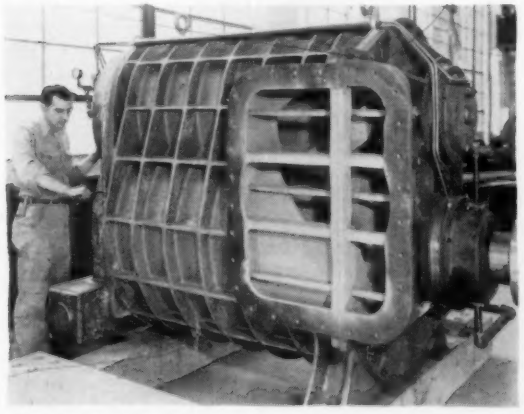
Worth Seeing

Blonde Carol Williams and brunette Lyn Pinson give that New Look to Athey Products Corp. and Hyster Company machines when more than 250 overseas men and women visited demonstrations of materials handling equipment in Chicago.

No, kiddies, these are not Space Men but two inspectors ready to go down into a Toledo sewer. Their Chemox breathing apparatus is made by Mine Safety Appliances Co., and is their guarantee of emerging in good health.



Another body blow at Old Man Winter is in the making here—A. M. Byers Company wrought iron pipe goes into snow melting coils under pavements to provide safe walking in icy weather around the Pittsburgh Golden Triangle.



A weight of air equivalent to the gross tonnage of four Queen Elizabeths is the annual capacity of just one of these 15,000 cfm Read Standard Corp. blowers ordered by the Chicago Pump Co. for Erie (Pa.) sewage plant. There will be three of them.

Just to cool you off now, while it is still hot weather for most of us, the Vermont state highway department contributes this artistic shot of a snow fence as a reminder of things to come—soon.

FOR MORE DETAILED INFORMATION WRITE FOR BULLETIN W-2A and W-10.

GOLDEN ANDERSON Valve Specialty Company

1244 RIDGE AVE., PITTSBURGH 33, PA.

Designers and Manufacturers of VALVES FOR AUTOMATION

SHOCK TAMER TWINS

These two automatic cushioned valves will prevent the hammer and shock normally caused by surges in the system.

G-A ELECTRIC CHECK VALVE

G-A SURGE RELIEF VALVE

WORTH TELLING

by Arthur K. Akers

★ KOMLINE-SANDERSON Engineering Corp., Peapack, N.J., appoints Eugene H. Trubnick as sales engineer, on applications of their Coilfilters in sewage treatment and disposal.

★ JEFFREY MFG. CO., Columbus, opens a district sales office at 116 S. Harrington St., Raleigh, N.C., with J. R. Brisley as manager.

★ H. B. BODENHAMER is named general sales manager, Universal Sewer Pipe Corp., and United States Concrete Pipe Co., Cleveland.

★ AERO SERVICE CORP., Philadelphia, announce their new Vinylite relief maps of California. Weight 2 lbs. instead of the 200 for plaster ones.

★ LOAN requests for a 20-min. 16-mm sound/color film on their membrane filter for bacteriological water analyses should be addressed: Publications Dept., Millipore Filter Corp., 36 Pleasant St., Watertown 72, Mass.

★ THE FRANK G. HOUGH CO., Libertyville, Ill., appoints Robert J. Sudlow as New England district representative, at Niantic, Conn.

★ JOSEPH F. CAVANAUGH is new director of public relations and sales promotion, Seaman-Andwall Corp. (Pulvi-Mixers) Milwaukee, a subsidiary of American-Marietta Co.

★ KARL K. HILGENDORF is now advertising manager, Cleaver-Brooks Co., Milwaukee.

★ RIDGE TOOL CO., Elyria, Ohio, names D. H. Rowe assistant sales manager.

★ INTERNATIONAL HARVESTER CO. announce John W. Branta as supervisor International motor truck advertising; William A. Adler as sales promotion supervisor.

★ HARRY F. BOWER is on 6-months loan by James B. Clow & Sons, Chicago pipe makers, to the U.S. Dept. of Commerce, Water and Sewerage Div., in Washington, succeeding Charles W. Krause of Neptune Meter Co.

★ MILTON L. JOHNSON is made vice president of engineering, Aquatrol Ferr-X Corp., Clifton, N.J.

Mr. Johnson

Mr. Wolfe

★ WARREN W. WOLFE succeeds Earl N. Mattson as manager of American Cast Iron Pipe Company's Chicago office. Mr. Wolfe has been 26 years with ACIPCO, 12 of them as assistant manager in Chicago. Mr. Mattson now retires.

★ ARTHUR R. TAYLOR is promoted to general manager of Bermico (pipe) Division, Brown Company, Boston.

★ R. E. BURTON becomes assistant general sales manager, Koehring Co., Milwaukee.

★ THE SIMPLEX VALVE & METER CO. establishes its New York office at 117 Liberty street. George L. Walker remains district manager. J. C. Holzwarth has been named advertising manager, in Lancaster Pa.

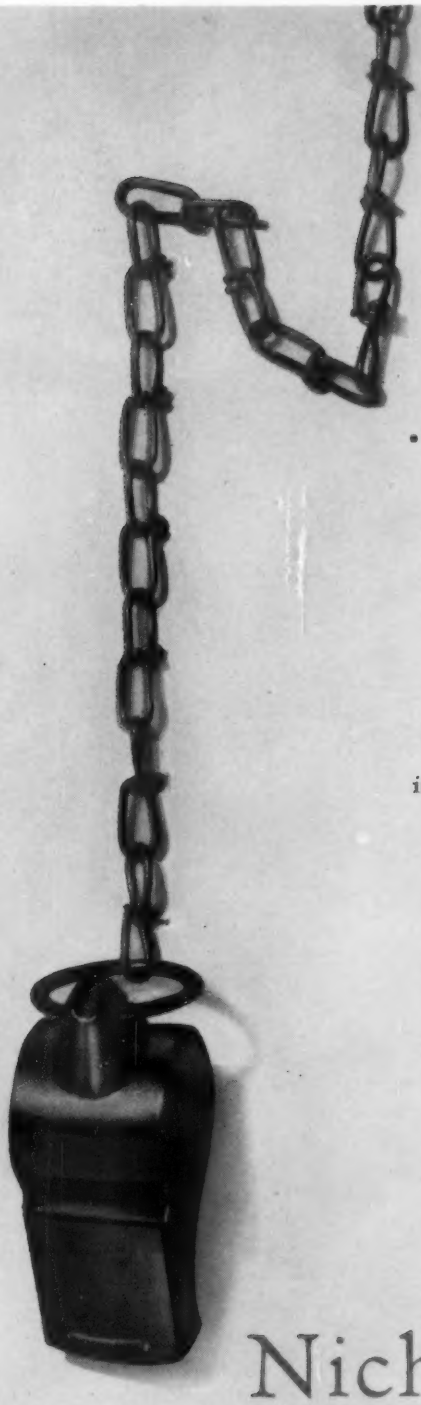
★ WILLIAM E. DICKINSON is now chief engineer, Calcium Chloride Institute, Washington.

★ WILLIAM H. DOMIN is new advertising manager, Tar Products Division, Koppers Co., Pittsburgh.

★ CONGRESSMEN wouldn't have so durn many political fences to mend if they hadn't done so much straddling.

—N. D. Coarse Screenings.

W & T 1919-type



Clean . . .

. . . is the word for it

"Clean as a whistle" helps us illustrate the fact that Nichols Herreshoff Multiple Hearth Dryer-Incinerators offer the cleanest of all drying methods. Combine that fact with the simplest of all incineration methods and the most economical of all dryer-incinerator processes and you will understand why Nichols Herreshoff is synonymous with the best in sludge disposal.

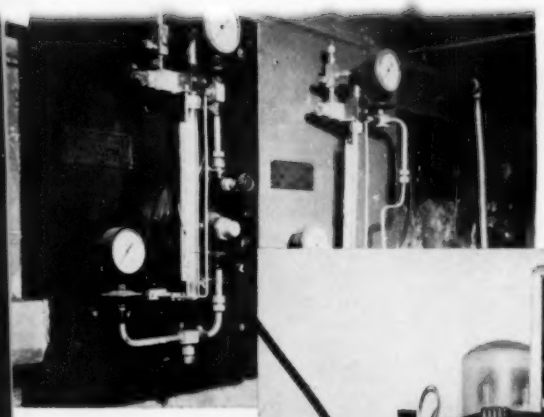
Nichols Herreshoff

Multiple Hearth Dryer-Incinerators

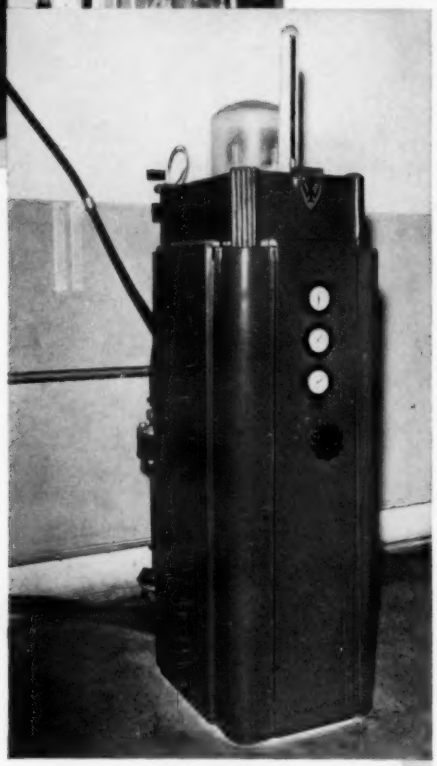
Nichols Engineering & Research Corp.
70 Pine St., New York 5, N. Y.
1637 N. Illinois St., Indianapolis 2, Ind.
1477 Sherbrooke St., W., Montreal 25, Canada

. . . and Nichols Monohearth Mechanically Stoked Refuse Incinerators

Get full details of this month's products . . . mail your Readers' Service card today.



W & T 1919-type
mechanical diaphragm
chlorinator



Modern W & T type
water diaphragm
chlorinator

June 24, 1955

Wallace & Tiernan, Incorporated
213 Carlton Terrace Building
Roanoke 13, Virginia

Gentlemen:

The first Wallace and Tiernan Chlorinator was installed in Lynchburg in 1919. Subsequently four additional chlorinators have been added as the need has developed. All being W & T equipment.

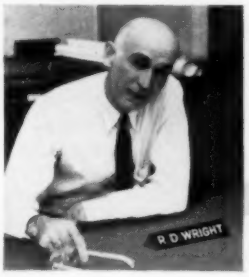
In addition to the Chlorinators we have one Wallace and Tiernan Fluoridator installed in 1951.

The application of chemicals in Lynchburg is more or less unique, in that we have to apply against head at all tires. This condition makes it necessary that all chemicals be applied in solution.

In all of our transactions with your organization for more than thirty-five years we have found your service and technical advice available at all times. Your equipment has stood up under what we believe to be adverse conditions, and its performance has been very satisfactory.

Very truly yours,

R. D. Wright, Director
Water Department



W & T CHLORINATORS — DEPENDABLE SERVICE...

"...for more than thirty-five years..."

Mr. R. D. Wright, Director, City of Lynchburg Water Department writes, "Your equipment has stood up under what we believe to be adverse conditions, and its performance has been very satisfactory." Lynchburg, Virginia has been using Wallace & Tiernan Chlorinators since 1919. *The original units are still in service,* along with more modern W&T equipment.

When you purchase a W & T Chlorinator, you purchase more than apparatus. You buy experience. Experience that brings you equipment design and materials of construction that have been selected and proven by years of use.

Lynchburg is not the exception. When your W&T representative visits you he can tell you about W&T chlorinators in your area, which are still giving dependable service after years of use.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

S-101